



UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MD 20814

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approved and signed.

THIS MATTER IS NOT SCHEDULED FOR A BALLOT VOTE.

A DECISIONAL MEETING FOR THIS MATTER IS SCHEDULED ON: MAY 8, 2013

April 17, 2013

TO: The Commission
Todd A. Stevenson, Secretary

THROUGH: Stephanie Tsacoumis, General Counsel
Kenneth R. Hinson, Executive Director

FROM: Patricia M. Pollitzer, Assistant General Counsel
Hyun S. Kim, Attorney, OGC

SUBJECT: Notice of Proposed Rulemaking: Safety Standard for Carriages and Strollers

The Office of the General Counsel is providing for Commission consideration the attached draft proposed rule for publication in the *Federal Register*. The proposed rule would establish a safety standard for carriages and strollers pursuant to the Danny Keysar Child Product Safety Notification Act, section 104 of the Consumer Product Safety Improvement Act of 2008.

Please indicate your vote on the following options:

- I. Approve publication of the attached document in the *Federal Register*, as drafted.

(Signature)

(Date)

- II. Approve publication of the attached document in the *Federal Register*, with changes.
(Please specify.)

(Signature)

(Date)

- III. Do not approve publication of the attached document in the *Federal Register*.

(Signature)

(Date)

- IV. Take other action. (Please specify.)

(Signature)

(Date)

Attachment: *Federal Register* Notice of Proposed Rulemaking to Establish a Safety Standard for Carriages and Strollers

Billing Code 6355-01-P

CONSUMER PRODUCT SAFETY COMMISSION

16 CFR Parts 1112 and 1227

Docket No. CPSC-2013-

Safety Standard for Carriages and Strollers

AGENCY: Consumer Product Safety Commission.

ACTION: Notice of Proposed Rulemaking.

SUMMARY: The Danny Keysar Child Product Safety Notification Act, Section 104 of the Consumer Product Safety Improvement Act of 2008 (CPSIA), requires the United States Consumer Product Safety Commission (Commission or CPSC) to promulgate consumer product safety standards for durable infant or toddler products. These standards are to be “substantially the same as” applicable voluntary standards or more stringent than the voluntary standard if the Commission concludes that more stringent requirements would further reduce the risk of injury associated with the product. The Commission is proposing a safety standard for carriages and strollers in response to the direction under Section 104(b) of the CPSIA.

DATES: Submit comments by [INSERT DATE 75 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: Comments related to the Paperwork Reduction Act aspects of the marking, labeling, and instructional literature of the proposed rule should be directed to the Office of Information and Regulatory Affairs, OMB, Attn: CPSC Desk Officer, FAX: 202-395-6974, or e-mailed to oir_submission@omb.eop.gov.

Other comments, identified by Docket No. CPSC-2013- , may be submitted electronically or in writing:

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Electronic Submissions: Submit electronic comments to the Federal eRulemaking Portal at: <http://www.regulations.gov>. Follow the instructions for submitting comments. The Commission does not accept comments submitted by electronic mail (e-mail), except through www.regulations.gov. The Commission encourages you to submit electronic comments by using the Federal eRulemaking Portal, as described above.

Written Submissions: Submit written submissions in the following way: Mail/Hand delivery/Courier (for paper, disk, or CD-ROM submissions), preferably in five copies, to: Office of the Secretary, Consumer Product Safety Commission, Room 820, 4330 East West Highway, Bethesda, MD 20814; telephone (301) 504-7923.

Instructions: All submissions received must include the agency name and docket number for this proposed rulemaking. All comments received may be posted without change, including any personal identifiers, contact information, or other personal information provided, to: <http://www.regulations.gov>. Do not submit confidential business information, trade secret information, or other sensitive or protected information that you do not want to be available to the public. If furnished at all, such information should be submitted in writing.

Docket: For access to the docket to read background documents or comments received, go to: <http://www.regulations.gov>, and insert the docket number, CPSC-2013- , into the “Search” box, and follow the prompts.

FOR FURTHER INFORMATION CONTACT: Rana Balci-Sinha, Project Manager, Division of Human Factors, Directorate for Engineering Sciences, Consumer Product Safety Commission, 5 Research Place, Rockville, MD 20850; telephone: 301-987-2584; e-mail: rbalcisinha@cpsc.gov.

SUPPLEMENTARY INFORMATION:

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I. Background and Statutory Authority

The Consumer Product Safety Improvement Act of 2008 (CPSIA, Pub Law 110-314) was enacted on August 14, 2008. Section 104(b) of the CPSIA, part of the Danny Keysar Child Product Safety Notification Act, requires the Commission to: (1) examine and assess the effectiveness of voluntary consumer product safety standards for durable infant or toddler products, in consultation with representatives of consumer groups, juvenile product manufacturers, and independent child product engineers and experts; and (2) promulgate consumer product safety standards for durable infant and toddler products. These standards are to be “substantially the same as” applicable voluntary standards or more stringent than the voluntary standard if the Commission concludes that more stringent requirements would further reduce the risk of injury associated with the product. The term “durable infant or toddler product” is defined in section 104(f)(1) of the CPSIA as “a durable product intended for use, or that may be reasonably expected to be used, by children under the age of 5 years.”

In this document, the Commission is proposing a safety standard for carriages and strollers. “Strollers” are specifically identified in section 104(f)(2)(I) of the CPSIA as a durable infant or toddler product. Pursuant to Section 104(b)(1)(A), the Commission consulted with manufacturers, retailers, trade organizations, laboratories, consumer advocacy groups, consultants, and members of the public in the development of this proposed standard, largely through the ASTM process. The proposed rule is based on the voluntary standard developed by ASTM International (formerly the American Society for Testing and Materials), ASTM F833-13, “Standard Consumer Safety Specification for Carriages and Strollers” (ASTM F833-13), with a proposed additional requirement and test method to address scissoring, pinching, or shearing hazards at the hinge link of 2D fold strollers. ASTM F833-13 includes carriages as well

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as strollers, as well as convertible carriages/strollers. Accordingly, the proposed rule would cover all of these product types.

The ASTM standard is copyrighted, but it can be viewed as a read-only document during the comment period on this proposal only, at: <http://www.astm.org/Standards/F833.htm>, by permission of ASTM.

II. Product Description

A. Definition of Carriage and Stroller

ASTM F833-13 “Standard Consumer Safety Performance Specification for Carriages and Strollers” defines a “stroller” as a wheeled vehicle to transport children usually from infancy to 36 months of age. Children are transported generally in a sitting-up or semi-reclined position. The motive power is supplied by a person moving at a walking rate while pushing on a handle attached to the stroller. Carriages, on the other hand, are wheeled vehicles to transport an infant usually in a lying down position. Thus, the principal difference between strollers and carriages is the position of the occupant. Both carriages and strollers may be capable of being folded for storage. Umbrella strollers are lightweight, compact when folded, and may lack certain accessories such as baskets underneath the seat or cup holders for the caregiver. Strollers that fold in two dimensions, the height and length are called “2D” strollers. Strollers that collapse in all three dimensions – height, length, and width—resulting in a smaller folded package than 2D strollers are called “3D” strollers. Other types of strollers include travel systems that accommodate an infant car seat on a stroller. If a stroller is intended to be used at a jogging rate, then it is called a jogging stroller. Some products can be used as both strollers and carriages (convertible carriages/strollers). Convertible carriages or strollers are intended to be converted by

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the owner to be used as a carriage or a stroller. Some strollers incorporate automatic or assisted folding and unfolding mechanisms.

B. Market Description

The majority of carriages/strollers are produced and/or marketed by juvenile product manufacturers and distributors. CPSC staff believes that there are currently at least 86 suppliers of carriages/strollers to the U.S. market. Thirty-four are domestic manufacturers, 33 are domestic importers, and the supply sources of seven domestic firms are unknown. In addition, 12 foreign firms supply strollers to the U.S. market—six foreign manufacturers, two firms that import products from foreign companies and distribute them from outside of the United States, two foreign retailers that ship directly to the United States, and two firms with unknown supply sources.

According to a 2005 survey conducted by the American Baby Group (*2006 Baby Products Tracking Study*), nearly all new mothers (99 percent) own at least one stroller. Based on data from the survey, nearly 4.1 million strollers are owned by new mothers, and there would be an estimated 9.1–11.2 million households with strollers available for use annually (4.1 million \times .99 \times 2.25 to 4.1 million \times .99 \times 2.75). Approximately 26 percent of strollers were handed down or purchased secondhand. Thus, about 74 percent of strollers were acquired new, and approximately 3 million strollers are sold to households annually (.99 \times .74 \times 4.1 million births per year). Strollers can cost anywhere between \$20 to \$1,200, depending upon the type and brand. On average, umbrella strollers tend to be the least expensive (around \$25–\$50 for the least costly versions); and most other strollers cost around \$150–\$300, with many carriages, travel systems, and jogging strollers costs running in the \$500–700 range. Strollers generally are used during a child's first two years, with some caregivers continuing to use strollers into the

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third year. Although CPSC staff does not know the proportion of consumers who continue to use strollers into the third year, CPSC staff believes that approximately 25–75 percent may do so.

III. Incident Data

The incident data was reviewed for carriages, strollers, and convertible carriages/strollers. There have been only a few incidents with no reported injuries associated with carriages, and CPSC staff has not identified any carriage-specific hazards. Accordingly, the incident data focuses on strollers. CPSC's Directorate for Epidemiology, Division of Hazard Analysis, is aware of a total of 1,207 incidents related to strollers reported from January 1, 2008 through December 31, 2012. The age range for the data extracted includes children 4 years old or younger (or unreported/unknown). Four incidents involved a fatality, and 1,203 incidents were nonfatal.

A. Fatalities

Four stroller-related fatalities were reported to CPSC from January 1, 2008 through December 31, 2012. Two of the incidents were related to insufficient clearance space between stroller components: in the first fatal incident, a 5-month old infant's head became entrapped between the seat and tray; in the second incident, a 5-month-old infant's head was wedged between the car seat of a travel system and a metal bar located under the cup holder. In the third fatal incident, the stroller collapsed onto a 4-year-old child, resulting in compressional asphyxiation. The fourth fatal incident occurred when the stroller fell off of a dock and into a bay, which resulted in the child drowning. However, that incident lacked sufficient details to determine if the fatality was product related.

B. Nonfatalities

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A total of 1,203 stroller-related nonfatal incidents were reported from January 1, 2008 through December 31, 2012. Of the nonfatal incidents, 359 resulted in an injury. Seventy-two of the nonfatal injuries were related to hinges; wheel-related issues resulted in 52 reported injuries; while locking mechanism failures were associated with 42 reported injuries. A total of 70 incidents resulted in moderate and severe injuries, such as lacerations requiring stitches, tooth extractions, fractures, head injuries, and partial amputations of fingers.

C. Hazard Pattern Identification

CPSC staff considered all of the fatal and nonfatal reported incidents to identify hazard patterns associated with strollers. The hazard patterns were grouped into the following categories:

Wheel issues were the most commonly reported hazard, with a total of 429 incidents (36 percent of the 1,207 incidents). The major hazard patterns included broken wheel rim, wheel detachment, and a burst tire. A total of 52 reported injuries occurred, including two hospitalizations due to falls that resulted in a bone fracture and head concussion.

Parking brake problems related to parking brake failure or assembly resulted in 132 incidents, including eight injuries. Incidents typically occurred when the parking brakes were assumed to be functional after setting them, but the stroller rolled away and struck an object.

Lock mechanism issues resulting in unexpected collapse of the stroller accounted for 121 incidents. One fatality was reported where the partially erected, unlatched stroller collapsed onto the child when he climbed into the seat, resulting in compressional asphyxiation. A total of 42 injuries were reported in this category, including two hospitalizations, one due to a fall that resulted in a skull fracture and the second due to the collapse of the stroller, resulting in an amputated finger.

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Restraint issues, such as a child unbuckling the restraint, restraint breakage or detachment, and restraints that are too loose were reported in 83 incidents, resulting in 29 injuries.

Hinge issues were reported in 75 incidents, resulting in 72 injuries. This is the highest injury rate of any stroller hazard category. Most of the hinge-related injuries occurred when a caregiver was unfolding the stroller for use and the child was climbing into the stroller. Reported injuries involved pinched, lacerated, or amputated fingers or arms, including one hospitalization for reattachment of a finger.

Structural integrity-related issues, such as failure or malfunction of various structural components (*e.g.*, frame, attachment points for the seat, footrest, and sunshades) resulted in 63 incidents. A total of 16 injuries were reported in this category, including one hospitalization due to a fall, which resulted in bleeding gums.

Stability/tip-over issues resulted in 58 incidents, including 24 reported injuries resulting mostly from falls.

Clearance issues between certain components of a stroller, such as seat and handlebar, basket, canopy, tray, or frame, between the footrest and wheel or between the car seat and handlebar resulted in 38 incidents including 19 injuries. Two fatalities were reported in this category. In the first incident, a 5-month-old victim's head was trapped between the edge of the car seat and a metal bar located right under the cup holder. In the second incident, a 5-month-old child had his head trapped in the opening between the stroller seat and tray.

Car seat attachment-related issues, including the car seat detaching, not locking, or tipping over, resulted in 35 incidents. Most of the incidents resulted in no injury, and five resulted in minor injuries, such as bumps.

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Canopy-related issues were involved in 24 incidents and resulted in 18 injuries. Sixteen injuries were due to canopy folds, where the child's finger was caught. One injury required hospitalization where a child's finger was reattached. Other hazards included cords that are attached to canopies, resulting in strangulation hazards and attachments with sharp edges or small parts.

Handlebar issues were involved in 21 incidents, resulting in seven injuries. One injury required hospitalization after a child's finger was caught in a reversible handle hinge and was amputated. Eleven incidents were the result of broken handlebars.

Seat-related issues, such as seat fabric tear resulted in 19 incidents including 4 injuries.

Sharp points or edges resulted in 18 incidents with 16 injuries.

Tray-related issues, such as breakage, detachment, or malfunction resulted in 14 incidents, including 11 injuries, eight involving fingers.

Unspecified category includes stroller-related incidents lacking sufficient information to determine the cause. There were 32 reported incidents in this category, including 21 injuries and one fatality. The fatal incident involved a stroller falling off of a dock and into a bay that resulted in a victim drowning. There were two hospitalizations: the first incident involved a child falling into a lake while strapped in his stroller, and the second incident involved a child falling off of his stroller at his home.

Miscellaneous problems, including strap detachment, logo detachment, rust, lead, tearing material, and jump seat detachment were involved in 40 incidents, including 15 with reported injuries. In 15 incidents, a child was choking on a toy accessory or tag that had been removed from the product. Five of the injuries resulted in unexpected detachment of jump seats while in use.

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In some cases, older children (5 years of age or older) and adults also got injured on the stroller. Strollers are not self-propelled and remain stationary until pushed by a person other than the occupant. Caregivers are also involved in setting up the stroller (*e.g.*, folding, unfolding, removing the stroller from the trunk, and pumping air into the stroller tire). Caregiver involvement requires a different set of interactions with the stroller and poses various risks. There were 78 reported stroller incidents that involved children older than 4 and adults: 20 of these injuries were moderate and severe. Out of 78 incidents, 72 involved victims between 17 and 64 years of age. Seventy-four incidents resulted in injuries, mostly to the fingers.

In addition, there were five consumer complaint reports with no incidents or injuries.

D. NEISS Data

In addition to the 1,207 incident reports received by the Commission, we estimated the number of injuries treated in U.S. hospital emergency departments using the CPSC's National Electronic Injury Surveillance System (NEISS). Over a 4-year-period, a total of 46,200 stroller-related injuries were treated in U.S. hospital emergency departments from January 2008 through December 2011. Because CPSC's NEISS data for 2012 is not yet finalized, only partial estimates for 2012 are available. There was no statistically significant increase or decrease observed in the estimated injuries from one year to the next, nor was there any statistically significant trend observed over the 4-year period from 2008 to 2011.

No fatalities were reported through NEISS. Most of the injuries (94%) were treated and released. Most of the incidents were related to falls on or off the stroller. A breakdown of the characteristics among the emergency department-treated injuries associated with strollers is presented in the bullets below:

- Injured body part – head (51%), face (24%), mouth (9%), finger (5%); and

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- Injury type – internal organ injury (36%), contusions/abrasions (24%), laceration (18%).

E. Product Recalls

Between January 1, 2008 and December 31, 2012, there were 29 recalls involving 6.82 million strollers and 15 different firms. The recalls related to incidents involving finger injuries, strangulation hazards, brake failures, choking hazards, and fall hazards. Additional information on these recalls can be found in staff's briefing package on the Commission's website at:

www.cpsc.gov or www.saferproducts.gov.

IV. Other Standards

A. International Standards

CPSC staff reviewed the performance requirements of the current ASTM standard, ASTM F833-13, to the performance requirements of other standards, including those from Canada, the European Union (EU), and Australia/New Zealand. Strollers and carriages are regulated products in Canada that must meet the requirements published by Health Canada in April 1985, SOR/85-379, *Carriages and Strollers Regulations*. Although Canada's regulation has no requirements that address head entrapment or buckle release, the Canadian restraint system strength requirements are more severe than those in ASTM F833-13. The stroller standard in Europe, published in March 2012, is EN 1888:2012, *Child care articles – Wheeled child conveyances – Safety requirements and test methods*, also does not contain requirements that address head entrapment or buckle release. However, the EN 1888 standard requires fatigue tests in several places to evaluate the durability of attachment points and locks/latches. The standard that covers stroller safety in Australia and New Zealand, published on December 14, 2009, AS/NZS 2088:2009 *Prams and strollers—Safety requirements*, is a very thorough and stringent stroller standard. However, the standard lacks a head entrapment test and a dynamic

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scissoring, shearing, and pinching test. This standard also requires fatigue tests to evaluate the durability of attachment points and locks/latches, similar to those found in EN 1888.

CPSC staff evaluated the requirements of the international standards and determined that the current ASTM F833-13 standard is the most comprehensive of the standards to address the incident hazards associated with strollers. Although some individual requirements in international standards are more stringent than ASTM F833-13, based on the current hazard patterns identified in the incident reports, CPSC is not proposing to adopt additional requirements at this time, with the exception of the proposed performance requirement and test procedure to address scissoring, shearing, and pinching hazards associated with 2D fold strollers. However, CPSC staff will continue to monitor hazard patterns and recommend future changes, if necessary.

B. Voluntary Standard – ASTM F833

1. History of ASTM F833

ASTM F833, “Standard Consumer Safety Performance Specification for Carriages and Strollers,” establishes safety performance requirements, test methods, and labeling requirements to minimize the hazards to children presented by carriages and strollers. ASTM first published a consumer product safety standard for strollers in 1983. It has been revised 20 times in the past 29 years, with six revisions in the past 5 years. By the end of 2008, the majority of the general requirements were in place, including the following:

- Latching mechanisms must resist unintentional folding when a 45 lb. force is applied five times in an attempt to fold the product without releasing a latch;
- Toy accessories must meet the requirements of ASTM F963, *Standard Consumer Safety Specification for Toy Safety*; and

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- Several general requirements common to ASTM standards, including: hazardous points and edges; small parts; paint and surface coatings; wood being smooth and free of splinters; holes and slots that could trap a child's finger; exposed coil springs; warning label permanency; and retention of protective components.

In addition, eight performance requirements were included in ASTM F833-08:

- *Parking Brake* - A parking brake must be provided and the braked wheels shall not rotate more than 90° when tested on a 12° incline.
- *Static Load* - A stroller shall support a weight of 100 lbs. or 2.5 times the manufacturer-recommended maximum weight in each individual seating area. A combination unit of a car seat on a stroller must support a 50-lb. weight.
- *Stability* - The product with a 17-lbm. CAMI dummy shall not tip over when placed on a 12° incline and shall not tip forward when a 40 lb. force is applied downward where a child would likely step to climb into the stroller.
- *Restraining System* - A three-point restraint system (waist and crotch) must be present and may not detach, nor may the adjusting elements permit slippage more than 1 in. when tested as follows:
 - a. Apply 45-lb. force to each anchoring point.
 - b. Insert CAMI infant dummy, secure restraints, and pull a leg with 45-lbs. of force five times.
- *Occupant Retention* – A wall surrounding all sides above the floor of the occupant space shall not permit the passage of a 3-in. diameter probe.

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- *Combination Unit of a Car Seat on a Stroller* – This section lists the specific requirements combination frame/car seat products must meet to eliminate omissions due to differing interpretations of the standard.
- *Impact Test* – The product shall not become damaged, and the car seat may not become completely separated from the frame, with 40 lb. (or maximum recommended weight) secured by the restraint system in each seating area, then allowed to roll 40 in. down a 20° slope into a rigid steel stop.
- *Passive Containment/Foot Opening* – Products with a tray or grab bar in front of the occupant that creates an opening that could potentially trap a child's head are not permitted. If the opening permits the passage of a 3.0 in. x 5.5 in. torso probe, it must also permit the passage of an 8.0-in. diameter head probe sphere.

Minor changes to the standard were made from 2008 through 2011. In addition to editorial alterations and clarifications, the 2009 revision (F833-09) excluded self-propelled products, including tricycles with push handles. The next revision, published in May 2010 (F833-10), added rotating seats to the stability test, and more importantly, made the impact test more stringent. In addition, the detachment of *any* car seat attachment point from a stroller frame would constitute a failure of the impact test. The 2011 version of the standard added a requirement specifying the text size for instructional literature warnings.

2. Description of the Current Voluntary Standard - ASTM F833-13

Since 2011, CPSC staff has worked with ASTM stakeholders in task groups to develop new requirements and improve certain requirements to address the hazards identified in the incident data. With the exception of a proposed performance requirement and test procedure to address scissoring, shearing, and pinching hazards associated with 2D fold strollers, CPSC finds

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that ASTM F833-13 will address the hazards identified in the incident data. This section discusses how each hazard pattern described is addressed in the current voluntary standard ASTM F833-13.

Wheel Issues - A new performance requirement addresses the wheel detachment hazard pattern. This requirement verifies the strength with which wheels are attached to the stroller. A wheel detachment test is applied to non-swivel wheels and swivel wheels, as well as to the wheels that are intended to be detached from a removable wheel fork assembly. A new warning label is also required on the front wheel fork, alerting the user to a possible tip-over hazard if the wheel is not attached securely. In addition, new warning labels are required for three-wheeled strollers, if the front wheel is intended to be locked during running, jogging, or walking fast.

Parking Brakes – ASTM F833-13 includes a modified performance requirement and associated test to address weak parking brakes. The improved requirement increases both the applied force (by approximately 50%) and the number of repetitions, resulting in a more stringent parking brake system performance requirement.

Lock Mechanism - A more stringent performance requirement requires the successful completion of a test that applies a force to the handle bars in a direction likely to break and disengage the folding latch system. This updated requirement will significantly reduce the hazard associated with weak lock/latch mechanisms.

Restraint - The requirements included in the ASTM standard prior to the 2013 version addressed restraint system breakage, detachment, and poor fit failure modes. ASTM F833-13 adds a new requirement to reduce the ability of a child to escape by unbuckling the harness straps. The new requirement states that the buckle shall either have a single-action release

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mechanism that does not release at a force less than 9 lbf., or a buckle that consists of a double-action release mechanism.

Hinges - The highest injury rate of any stroller hazard category arises from scissoring, pinching, or shearing at the hinge link of 2D and 3D strollers. Even though certain pinching and shearing hazards are addressed in the previous versions of the standard, this requirement applied only after the stroller was erected and secured. Incident data showed that the majority of the injuries occurred when the stroller was partially erected; therefore, a new requirement addressing the hazard during the unfolding action was necessary. ASTM F833-13 now includes a requirement to address the hinge link hazards on 3D fold strollers, but it still fails to address 2D fold strollers. The proposed rule would add a performance requirement and test method similar to the provisions for 3D fold strollers to address hinge link hazards on 2D fold strollers.

Structural Integrity - ASTM F833-13 contains performance requirements that contribute to the general evaluation of structural integrity, including latching mechanisms, parking brake requirements, static load, stability, restraining system, and impact test.

Stability/Tip Over - Performance requirements associated with stability have been strengthened in ASTM F833-13 to account for strollers that have rearward or swiveling seats that can face multiple directions. In addition, testing requirements for stability have been modified so that the test is executed to a more stringent stability performance requirement.

Clearance - In addition to the preexisting requirement associated with evaluating the gap between the seat and front tray to prevent head entrapment, ASTM F833-13 requires a new entrapment test with a car seat on a stroller or convertible carriage/stroller. This additional requirement addresses the fatality scenario in which a child was found suspended between the foot end of a car seat and a metal bar under the cup holder tray.

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Car Seat Attachment - ASTM F833-13 requires combination units to meet general requirements associated with latching, parking brakes, static load, and stability and tip over.

Canopy - ASTM F833-13 includes a new performance requirement to address the scissoring, shearing, and pinching hazard caused by canopy pivots. In addition, the standard incorporates a new performance requirement to address the strangulation hazard associated with cords and straps within the “occupant space,” by eliminating cords or straps that can create a hazardous loop.

Handlebar – ASTM F833-13 addresses the structural integrity of handlebar hinges and latches, the strength of metal frame, and handle grip structural integrity with an improved latch performance requirement.

Seat - The separated seam failure mode is addressed by ASTM F833-13 with the static load performance requirement. This requirement states that the seat shall support 100 lbs. or 2.5 times the manufacturer’s recommended maximum weight, whichever is greater.

Sharp Points or Edges- Sharp points and edges are addressed in ASTM F833-13.

Tray - Most of the incidents associated with trays involve pinch hazards with the closing motion or gaps that entrap small fingers. Although ASTM F833-13 does not specifically address scissoring, shearing, and pinching hazards due to tray articulation, latching, and locking, it does include a general requirement for openings.

Miscellaneous - Choking hazards are addressed by ASTM F833-13 in the small parts prohibition section, labeling section, as well as the toy accessories requirement.

Older Children and Adults - The requirements added to or improved in ASTM F833-13, and the proposed new requirement and test method to address scissoring, shearing, and pinching hazards associated with 2D fold strollers, may address nearly half of the adult injury hazard

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patterns that were identified by CPSC staff.

IV. Proposed Change to ASTM F833-13

Hinge issues were reported in 75 incidents, resulting in 72 injuries. This is the highest injury rate of any stroller hazard category. Most of the hinge-related injuries resulted from scissoring, pinching, or shearing at the hinge link of 2D and 3D strollers. Most of the incidents occurred when a caregiver was unfolding the stroller for use and the child was climbing into the stroller. Reported injuries involved pinched, lacerated, or amputated fingers or arms, including one hospitalization for reattachment of a finger. Incident data show that the majority of the injuries occurred when the stroller was partially erected; therefore, a new requirement addressing the hazard during the unfolding action had to be developed. Although ASTM F833-13 now includes a requirement addressing this hazard in the 3D fold strollers, it does not address 2D fold strollers. For 3D fold strollers, ASTM F833-13 requires that 3D saddle hinges must be constructed to prevent injury from scissoring, shearing, or pinching. The 3D fold test is dynamic. The stroller is partially unfolded so that the main side rail tubes are positioned 90° to one another. Saddle hinge scissoring, shearing, and pinching conditions are checked for with the two probes (0.210-in. and 0.375-in. diameter) while opening the stroller into the manufacturer's recommended open and locked position.

The proposed rule would add a performance requirement and test method similar to the provisions for 3D fold strollers to address scissoring, shearing, and pinching hazards associated with 2D fold strollers. The proposed new requirement would provide that the frame folding action of a stroller shall not create a scissoring, shearing, or pinching hazard when tested. The proposed new test is dynamic, like the saddle hinge test, and the test also determines if the hazard exists with the same two probes while the stroller is moved from a partially to the fully

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erect and locked position. Scissoring, shearing, or pinching that may cause injury exists when the edges of the rigid parts admit a 0.210-in diameter probe but do not admit a 0.375-in diameter probe when tested. Based on the incident data and anthropometric dimensions of the child occupant, the proposal defines an “access zone” that is easily accessible by a child. All hinges that are within the access zone must be checked for a scissoring, shearing, or pinching hazard while the stroller is moved from a partially to a fully erect and locked position. Adding this new performance requirement and test procedure would significantly reduce the risk of injury associated with the frame folding action.

V. Effective Date

The Administrative Procedure Act (APA) generally requires that the effective date of the rule be at least 30 days after publication of the final rule. 5 U.S.C. 553(d). On April 7, 2012, CPSC staff received a letter from the Juvenile Products Manufacturers Association (JPMA), asking for an effective date of 24 months following publication of the carriage and stroller final rule. In that letter, JPMA stated that many challenges remain before implementing the new requirements, including design changes and revised product development schedules. The ASTM balloting process in February 2013 generated more recent comments regarding the effective date. Several manufacturers commented again on the need for additional time for compliance to address significant design and development redesign implementation. However, these commenters now request 18 months. The Commission is aware that significant revisions were made to the latest version of the standard requiring many modifications to carriages and strollers. Due to the complexity of stroller designs, and to allow time for manufacturers of carriage/stroller products to come into compliance, the Commission proposes that the standard become effective 18 months after publication of a final rule in the *Federal Register*. The Commission invites

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comment on whether 18 months is an appropriate length of time for carriage/stroller manufacturers to come into compliance with the rule.

VI. Regulatory Flexibility Act

1. Introduction

The Regulatory Flexibility Act (RFA) requires that proposed rules be reviewed for their potential economic impact on small entities, including small businesses. Section 603 of the RFA generally requires that agencies prepare an initial regulatory flexibility analysis and make it available to the public for comment when a general notice of proposed rulemaking is published. The initial regulatory flexibility analysis must describe the impact of the proposed rule on small entities and identify any alternatives that may reduce the impact. Specifically, the initial regulatory flexibility analysis must contain:

- a description of, and where feasible, an estimate of the number of small entities to which the proposed rule will apply;
- a description of the reasons why action by the agency is being considered;
- a succinct statement of the objectives of, and legal basis for, the proposed rule;
- a description of the projected reporting, recordkeeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities subject to the requirements and the types of professional skills necessary for the preparation of reports or records; and
- identification, to the extent possible, of all relevant federal rules which may duplicate, overlap, or conflict with the proposed rule.

2. Reason for Agency Action and Legal Basis for the Proposed Rule

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The Danny Keysar Child Product Safety Notification Act, section 104 of the CPSIA, requires the CPSC to promulgate mandatory standards that are substantially the same as, or more stringent than, the voluntary standard for a durable infant or toddler product. CPSC staff worked closely with ASTM stakeholders to develop the new requirements and test procedures that have been incorporated into ASTM F833-13, which forms the basis of the proposed rule.

3. Other Federal Rules

Section 14(a)(2) of the CPSA requires every manufacturer and private labeler of a children's product that is subject to a children's product safety rule to certify, based on third party testing conducted by a CPSC-accepted laboratory, that the product complies with all applicable children's product safety rules. Section 14(i)(2) of the CPSA requires the Commission to establish protocols and standards, by rule, for among other things, ensuring that a children's product is tested periodically and where there has been a material change in the product, and for safeguarding against the exercise of undue influence on a conformity assessment body by a manufacturer or private labeler. A final rule implementing sections 14(a)(2) and 14(i)(2) of CPSA, *Testing and Labeling Pertaining to Product Certification*, 16 CFR part 1107, became effective on February 13, 2013 (the 1107 rule).

Carriages and strollers will be subject to a mandatory children's product safety rule, so they will also be subject to the third party testing requirements of section 14 of the CPSA and the 1107 rule when the final rule and the notice of requirements become effective.

4. Impact on Small Businesses

Approximately 86 firms currently supply carriages/strollers in the U.S. market. Under U.S. Small Business Administration (SBA) guidelines, a manufacturer is small if it has 500 or fewer employees, and importers and wholesalers are considered small if they have 100 or fewer

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employees. Based on these guidelines, about 51 suppliers are small firms—26 domestic manufacturers, 22 domestic importers, and three firms with unknown supply sources. There may be additional unknown small carriage/stroller suppliers operating in the U.S. market.

Small Manufacturers. The expected impact of the proposed rule on small manufacturers will differ based on whether their carriages/strollers are already compliant with ASTM F833-11. In general, firms whose carriages/strollers meet the requirements of ASTM F833-11 are likely to continue to comply with the voluntary standard as new versions are published. In addition, they are likely to meet any new standard before a final rule becomes effective. Many of these firms are active in the ASTM standard development process, and compliance with the voluntary standard is part of an established business practice.

Meeting ASTM F833-13's requirements could necessitate product redesign for at least some carriages/strollers not believed to be compliant with ASTM F833-11 (7 of 26 small domestic manufacturers). A redesign would be minor if most of the changes involve adding straps and fasteners or using different mesh or fabric, but could be more significant if changes to the frame are required. Due to the complexity of carriages/strollers, a complete redesign of these products, including engineering time, prototype development, tooling, and other incidental costs, could exceed \$1 million for the most complex models. Industry sources, including JPMA, note that new tooling alone could exceed \$300,000 per product model. However, costs and development time are likely to vary widely across firms. Companies with substantial experience in manufacturing carriages/strollers should be able to complete redesigns more cost effectively than firms with less experience. Additionally, firms with numerous carriage/stroller models may experience lower costs because models could be redesigned as a group.

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The direct impact on manufacturers whose products are expected to meet the requirements of ASTM F833-13 (19 of 26 small domestic manufacturers) could be significant in some cases, due to the proposed 2D frame folding requirement, as well as the relatively low revenues associated with many small manufacturers. While meeting this requirement could be as simple as replacing hinges or adding covers, this may not be a realistic alternative for some firms. According to one manufacturer, it is difficult to make added parts look cohesive with the original product, a quality that consumers might prefer. Therefore, some firms may need to develop new models, rather than try to create cohesive products by retrofitting older models. The majority of small manufacturers have at least one 2D stroller model; so it is possible that at least some will opt to redesign their existing noncompliant strollers.

The direct costs of design/redesign on firms may be mitigated if the costs are treated as new product expenses that can be amortized, and the Commission is proposing an 18-month effective date to help reduce further the impact of the proposed rule. This would give firms additional time to develop new/modified products and spread costs over a longer time frame. It is possible that additional time beyond 18 months may be required, however; and CPSC requests specific comments on alternative effective dates.

In addition, once the rule becomes final and the notice of requirements is in effect, all manufacturers will be subject to the additional costs associated with the third party testing and certification requirements. This will include any physical and mechanical test requirements specified in the final rule; lead and phthalates testing is already required.

CPSC staff estimates that testing to the ASTM voluntary standard could cost about \$800–\$1,000 per model sample. On average, each small domestic manufacturer supplies seven different models of carriages/strollers to the U.S. market annually. Therefore, if third party

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testing were conducted every year on a single sample for each model, third party testing costs for each manufacturer would be about \$5,600–\$7,000 annually. Based on a review of firm revenues, the impact of third party testing to ASTM F833-13 is unlikely to be significant if only one sample per model is required. However, if more than one sample would be needed to meet the testing requirements, it is possible that third party testing costs could have a significant impact on one or more of the small manufacturers.

Small Importers. Most small importers of carriages/strollers currently in compliance with F833-11 (13 of 22 small domestic importers) would likely continue to comply with the standard as it evolves. Any increase in production costs experienced by their suppliers may be passed on to them. Given the possibility that even firms with compliant products may opt to design a new carriage/stroller rather than retrofit their existing models, the costs associated with the added 2D folding frame requirement could be significant for some firms, especially those that do not follow the ASTM standard development process (as is the case with at least one small importer of compliant strollers).

Importers of carriages/strollers would need to find an alternate source if their existing supplier does not come into compliance with the requirements of the proposed rule (currently, nine importers of strollers may not be in compliance with F833-11). Some could respond to the rule by discontinuing the import of their noncomplying products, possibly discontinuing the product line altogether. The impact of such a decision could be mitigated by replacing the noncompliant carriage/stroller with a compliant carriage/stroller or by deciding to import an alternative product in place of the carriage/stroller. However, some of these firms have few or no other products in their product line.

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Because many of these firms have low sales revenues and limited product lines apart from carriages/strollers and carriage/stroller accessories, it is possible that the proposed rule could have a significant impact on one or more importers. The proposed 18-month effective date would spread the costs of compliance over a longer period of time, mitigating the impact on all importers.

As is the case with manufacturers, all importers will be subject to third party testing and certification requirements, and consequently, will experience costs similar to those for manufacturers if their supplying foreign firm(s) does not perform third party testing. The resulting costs could have a significant impact on a few small importers who must perform the testing themselves, even if only one sample per model were required.

Alternatives. Under the Danny Keysar Child Product Safety Notification Act, one alternative that would reduce the impact on small entities is to make the voluntary standard mandatory with no modifications. Doing so would eliminate the impact on the 19 small manufacturers and 13 small importers with compliant products. However, adopting the voluntary standard with no modifications may not substantially benefit firms with noncompliant products, as their carriages/strollers might still require redesign.

The proposed 18-month effective date will allow suppliers additional time to modify and/or develop compliant carriages/strollers and spread the associated costs over a longer period of time. However, the Commission could opt to set an even later effective date. Doing so could reduce further the impact on affected firms. A third alternative would be to set an earlier effective date. However, setting an earlier effective date could increase the impact of the rule on small entities.

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VII. Environmental Considerations

The Commission's regulations address whether we are required to prepare an environmental assessment or an environmental impact statement. If our rule has "little or no potential for affecting the human environment," it will be categorically exempted from this requirement. 16 CFR 1021.5(c)(1). The proposed rule falls within the categorical exemption.

VIII. Paperwork Reduction Act

This proposed rule contains information collection requirements that are subject to public comment and review by the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995 (44 U.S.C. §§ 3501–3521). In this document, pursuant to 44 U.S.C. 3507(a)(1)(D), we set forth:

- a title for the collection of information;
- a summary of the collection of information;
- a brief description of the need for the information and the proposed use of the information;
- a description of the likely respondents and proposed frequency of response to the collection of information;
- an estimate of the burden that shall result from the collection of information; and
- notice that comments may be submitted to the OMB.

Title: Safety Standard for Carriages and Strollers

Description: The proposed rule would require each stroller/carriage to comply with ASTM F833-13, Standard Consumer Safety Performance Specification for Carriages and Strollers. Sections 8 and 9 of ASTM F833-13 contain requirements for marking, labeling, and

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instructional literature. These requirements fall within the definition of “collection of information,” as defined in 44 U.S.C. § 3502(3).

Description of Respondents: Persons who manufacture or import carriages and/or strollers.

Estimated Burden: We estimate the burden of this collection of information as follows:

Table 1 – Estimated Annual Reporting Burden

16 CFR Section	Number of Respondents	Frequency of Responses	Total Annual Responses	Hours per Response	Total Burden Hours
1227	86	6	516	1	516

Our estimates are based on the following:

Section 8.1.1 of ASTM F833-13 requires that the name and the place of business (city, state, mailing address, including zip code, or telephone number) of the manufacturer, distributor, or seller be marked clearly and legibly on each product and its retail package. Section 8.1.2 of ASTM F833-13 requires a code mark or other means that identifies the date (month and year, as a minimum) of manufacture.

There are 86 known entities supplying strollers/carriages to the U.S. market. All 86 firms are assumed to use labels already on both their products and their packaging, but they might need to make some modifications to their existing labels. The estimated time required to make these modifications is about 1 hour per model. Each entity supplies an average of six different models of strollers/carriages; therefore, the estimated burden associated with labels is 1 hour per model x 86 entities x 6 models per entity = 516 hours. We estimate the hourly compensation for the time required to create and update labels is \$27.12 (U.S. Bureau of Labor Statistics, “Employer Costs for Employee Compensation,” December 2012, Table 9, total

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compensation for all sales and office workers in goods-producing private industries:

<http://www.bls.gov/ncs/>). Therefore, the estimated annual cost to industry associated with the labeling requirements is \$13,993.92 (\$27.12 per hour x 516 hours = \$13,993.92). There are no operating, maintenance, or capital costs associated with the collection.

Section 9.1 of ASTM F833-13 requires instructions to be supplied with the product. Carriages/strollers are products that generally require assembly, and products sold without such information would not be able to compete successfully with products supplying this information. Under the OMB's regulations (5 CFR 1320.3(b)(2)), the time, effort, and financial resources necessary to comply with a collection of information that would be incurred by persons in the "normal course of their activities" are excluded from a burden estimate, where an agency demonstrates that the disclosure activities required to comply are "usual and customary." Therefore, because we are unaware of carriages/strollers that generally require some installation, but lack any instructions to the user about such installation, we tentatively estimate that there are no burden hours associated with section 9.1 of ASTM F833-13 because any burden associated with supplying instructions with carriages/strollers would be "usual and customary" and not within the definition of "burden" under the OMB's regulations.

Based on this analysis, the proposed standard for strollers and carriages would impose a burden to industry of 516 hours at a cost of \$13,993.92 annually.

In compliance with the Paperwork Reduction Act of 1995 (44 U.S.C. § 3507(d)), we have submitted the information collection requirements of this rule to the OMB for review. Interested persons are requested to submit comments regarding information collection by [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL

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REGISTER], to the Office of Information and Regulatory Affairs, OMB (see the ADDRESSES section at the beginning of this notice).

Pursuant to 44 U.S.C. § 3506(c)(2)(A), we invite comments on:

- whether the collection of information is necessary for the proper performance of the CPSC's functions, including whether the information will have practical utility;
- the accuracy of the CPSC's estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used;
- ways to enhance the quality, utility, and clarity of the information to be collected;
- ways to reduce the burden of the collection of information on respondents, including the use of automated collection techniques, when appropriate, and other forms of information technology; and the estimated burden hours associated with label modification, including any alternative estimates.

IX. Preemption

Section 26(a) of the CPSA, 15 U.S.C. 2075(a), provides that where a consumer product safety standard is in effect and applies to a product, no state or political subdivision of a state may either establish or continue in effect a requirement dealing with the same risk of injury unless the state requirement is identical to the federal standard. Section 26(c) of the CPSA also provides that states or political subdivisions of states may apply to the Commission for an exemption from this preemption under certain circumstances. Section 104(b) of the CPSIA refers to the rules to be issued under that section as "consumer product safety rules," thus implying that the preemptive effect of section 26(a) of the CPSA would apply. Therefore, a rule issued under section 104 of the CPSIA will invoke the preemptive effect of section 26(a) of the

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CPSA when it becomes effective.

X. Certification and Notice of Requirements (NOR)

Section 14(a) of the CPSA imposes the requirement that products subject to a consumer product safety rule under the CPSA, or to a similar rule, ban, standard or regulation under any other act enforced by the Commission, must be certified as complying with all applicable CPSC-enforced requirements. 15 U.S.C. 2063(a). Section 14(a)(2) of the CPSA requires that certification of children's products subject to a children's product safety rule be based on testing conducted by a CPSC-accepted third party conformity assessment body. Section 14(a)(3) of the CPSA requires the Commission to publish a notice of requirements (NOR) for the accreditation of third party conformity assessment bodies (or laboratories) to assess conformity with a children's product safety rule to which a children's product is subject. The proposed rule for 16 CFR part 1227, "Safety Standard for Carriages and Strollers," when issued as a final rule, will be a children's product safety rule that requires the issuance of an NOR.

The Commission recently published a final rule, *Requirements Pertaining to Third Party Conformity Assessment Bodies*, 78 FR 15836 (March 12, 2013), which is codified at 16 CFR part 1112 (referred to here as Part 1112). This rule will take effect June 10, 2013. Part 1112 establishes requirements for accreditation of third party conformity assessment bodies (or laboratories) to test for conformance with a children's product safety rule in accordance with Section 14(a)(2) of the CPSA. The final rule also codifies all of the NORs that the CPSC had published to date. All new NORs, such as the carriages and strollers standard, require an amendment to part 1112. Accordingly, the proposed rule would amend part 1112 to include the carriages and strollers standard along with the other children's product safety rules for which the CPSC has issued NORs.

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Laboratories applying for acceptance as a CPSC-accepted third party conformity assessment body to test to the new standard for carriages and strollers would be required to meet the third party conformity assessment body accreditation requirements in part 1112. When a laboratory meets the requirements as a CPSC-accepted third party conformity assessment body, it can apply to the CPSC to have 16 CFR part 1227, *Safety Standard for Carriages and Strollers*, included in its scope of accreditation of CPSC safety rules listed for the laboratory on the CPSC website at: www.cpsc.gov/labsearch.

In connection with the part 1112 rulemaking, CPSC staff conducted an analysis of the potential impacts on small entities of the proposed rule establishing accreditation requirements, 77 FR 31086, 31123-26 (May 24, 2012), as required by the Regulatory Flexibility Act and prepared an Initial Regulatory Flexibility Analysis (IRFA). Briefly, the IRFA concluded that the requirements would not have a significant adverse impact on a substantial number of small laboratories because no requirements are imposed on laboratories that do not intend to provide third party testing services under section 14(a)(2) of the CPSA. The only laboratories that are expected to provide such services are those that anticipate receiving sufficient revenue from providing the mandated testing to justify accepting the requirements as a business decision. Laboratories that do not expect to receive sufficient revenue from these services to justify accepting these requirements would not likely pursue accreditation for this purpose. Similarly, amending the part 1112 rule to include the NOR for the carriages and strollers standard would not have a significant adverse impact on small laboratories. Moreover, based upon the number of laboratories in the United States that have applied for CPSC acceptance of the accreditation to test for conformance to other juvenile product standards, we expect that only a few laboratories will seek CPSC acceptance of their accreditation to test for conformance with the carriages and

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strollers standard. Most of these laboratories will have already been accredited to test for conformance to other juvenile product standards and the only costs to them would be the cost of adding the carriages and strollers standard to their scope of accreditation. As a consequence, the Commission certifies that the proposed notice requirements for the carriages and strollers standard will not have a significant impact on a substantial number of small entities.

XI. Request for Comments

This proposed rule begins a rulemaking proceeding under section 104(b) of the CPSIA to issue a consumer product safety standard for carriages and strollers. We invite all interested persons to submit comments on any aspect of the proposed rule. Comments should be submitted in accordance with the instructions in the **ADDRESSES** section at the beginning of this notice.

List of Subjects

16 CFR Part 1112

Administrative practice and procedure, Audit, Consumer protection, Reporting and recordkeeping requirements, Third party conformity assessment body.

16 CFR Part 1227

Consumer protection, Imports, Incorporation by reference, Infants and children, Labeling, Law enforcement, and Toys.

For the reasons discussed in the preamble, the Commission proposes to amend Title 16 of the Code of Federal Regulations as follows:

PART 1112—REQUIREMENTS PERTAINING TO THIRD PARTY CONFORMITY ASSESSMENT BODIES

1. The authority citation for part 1112 continues to read as follows:

Authority: 15 U.S.C. 2063; Pub. L. 110-314, section 3, 122 Stat. 3016, 3017 (2008).

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2. Amend Part 1112.15 by adding paragraph (b)(37) to read as follows:

§ 1112.15 When can a third party conformity assessment body apply for CPSC acceptance for a particular CPSC rule and/or test method?

* * * * *

(b) The CPSC has published the requirements for accreditation for third party conformity assessment bodies to assess conformity for the following CPSC rules or test methods:

* * * * *

(37) 16 CFR part 1227, Safety Standard for Carriages and Strollers.

PART 1227-SAFETY STANDARD FOR CARRIAGES AND STROLLERS

Sec.

1227.1 Scope.

1227.2 Requirements for Carriages and Strollers.

Authority: The Consumer Product Safety Improvement Act of 2008, Pub. L. 110-314, § 104, 122 Stat. 3016 (August 14, 2008); Pub. L. 112-28, 125 Stat. 273 (August 12, 2011).

§ 1227.1 Scope.

This part establishes a consumer product safety standard for carriages and strollers.

§ 1227.2 Requirements for Carriages and Strollers.

(a) Each carriage and stroller must comply with all applicable provisions of ASTM F833-13, Standard Consumer Safety Specification for Carriages and Strollers, approved on April 1, 2013. The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. You may obtain a copy from ASTM International, 100 Bar Harbor Drive, P.O. Box 0700, West Conshohocken, PA 19428; <http://www.astm.org/cpsc.htm>. You may inspect a copy at the Office of the Secretary, U.S.

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Consumer Product Safety Commission, Room 820, 4330 East West Highway, Bethesda, MD 20814, telephone 301-504-7923, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to:

http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

(b) Comply with ASTM F833-13 standard with the following additions:

(1) In addition to complying with section 3.1.21 of ASTM F833-13, comply with the following:

(i) 3.1.22 *2D fold stroller, n-a* stroller that folds the handlebars and leg tubes only in the front-to-back (or back-to-front) direction.

(ii) [Reserved]

(2) Instead of complying with section 5.7 of ASTM F833-13, comply with the following:

(i) 5.7 *Scissoring, Shearing, and Pinching*

(ii) [Reserved]

(3) In addition to complying with section 5.7.3 of ASTM F833-13, comply with the following:

(i) 5.7.4 The frame folding action of a 2D fold stroller and convertible carriage/stroller (carriages are exempted from this requirement) shall be designed and constructed so as to prevent injury from scissoring, shearing, or pinching. Scissoring, shearing, or pinching that may cause injury exists when the edges of the rigid parts admit a 0.210-in (5.33-mm) diameter probe but do not admit a 0.375-in (9.53-mm) diameter probe when tested in accordance with 7.18.

Units with a removable seat that prevent the complete folding of the unit when still attached are

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exempt from this requirement. Note: The evaluation at any given location is performed with the understanding that the probes are allowed to enter the location from any angle/direction.

(ii) [Reserved]

(4) In addition to complying with section 7.17 of ASTM F833-13, comply with the following:

(i) 7.18 *Frame Folding Scissoring, Shearing, and Pinching*

(A) 7.18.1 2D fold stroller and convertible carriage/stroller evaluation: Place the unit's seatback in the most upright position. Identify and mark the portion of the unit's rigid frame members and hinges that have potential scissoring, shearing, or pinching action during folding of the unit and are within or penetrate the access zone shown in the Fig X anywhere within the width of the stroller. All marked portions of the frame shall be evaluated per 7.18.2 or 7.18.3 as applicable. For units that feature two or more folding operations that are able to be carried out independently or each other, each operation must be independently evaluated per the test methods in 7.18.2 or 7.18.3 as applicable. This includes all seat-facing positions as recommended by the manufacturer and each occupant position on multiple occupancy units. Tray and front grab bar movements not a result of unfolding operation are excluded from this evaluation.

(B) 7.18.2 *For units where the front and rear wheels move toward each other during folding* – measure the change in distance (distance A, see Fig Y) between the front and rear wheel axle centers when moving from the completely folded to completely erected position. The measurement shall be taken with any swivel wheels in the locked position and in the plane where the axel centerlines are perpendicular to the fore/aft horizontal axis of the stroller. To determine the starting point for testing, start folding the unit from erect to folded/"closed" position until the

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distance between the wheel axel centers is $\frac{2}{3}$ of the total travel distance (see figure Y for an example). From this point check the marked portions identified in 7.18.1 for scissoring, shearing, and pinching in accordance with 5.7.4 while moving the stroller from this partially folded position to the fully erect and locked position.

(C) 7.18.3 *For units where the front and rear wheels axle centers move away from each other or do not change distance during folding* – place the unit in partially erect position so the handle tube is rotated 90 deg. from the fully erect and locked position. From this point assess the marked portions identified in 7.18.1 for scissoring, shearing, and pinching in accordance with 5.7.4 while moving the unit from this partially folded position to the fully erect and locked position.

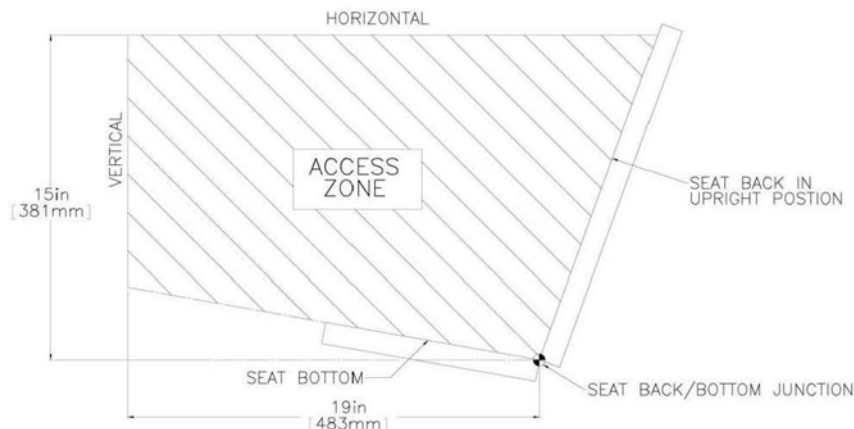


FIG. X, ACCESS ZONE

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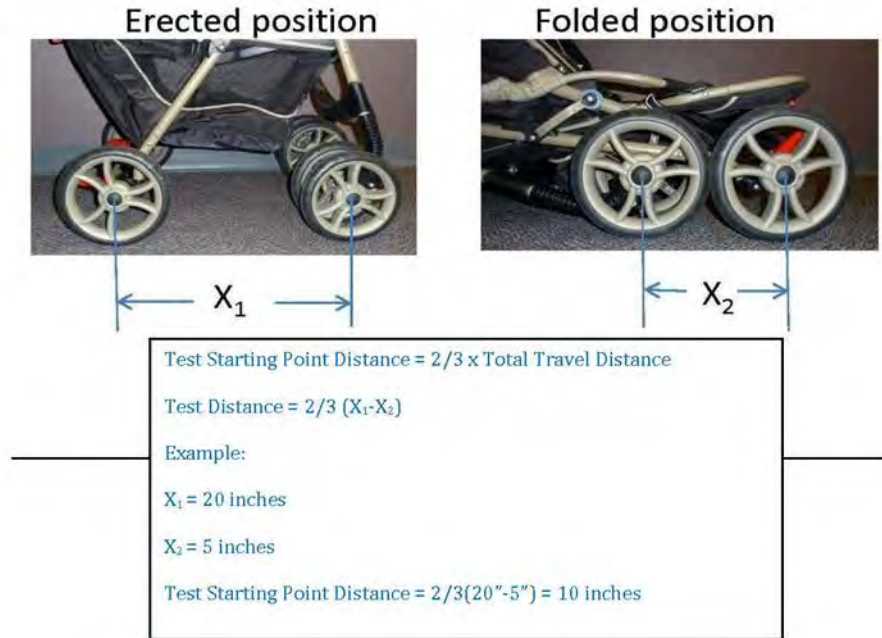


FIG. Y EXAMPLE OF TRAVEL DISTANCE CALCULATION

(ii) [Reserved]

(5) In addition to complying with the Appendix of ASTM F833-13, comply with the following:

(i) XI.18 *Rationale for 7.18*: A 3 year old child's sitting shoulder height is 15 inches and upper limb length is 19 inches based on 95th percentile 3-year old child's measurements (Pheasant, S.T. (1996). *Bodyspace: Anthropometrics, Ergonomics and the Design of Work* (2nd ed.). London, UK: Taylor & Francis). The access zone covers a child sitting in the most upright position reaching forward hence the reason for defining 19" from the seat back junction.

(ii) [Reserved]

Dated: _____

Todd A. Stevenson,
Secretary, Consumer Product Safety Commission



Staff Briefing Package

Section 104 of the Consumer Product Safety
Improvement Act of 2008:

Safety Standard for Carriages and Strollers
Notice of Proposed Rulemaking

April 17, 2013

CPSC Hotline: 1-800-638-CPSC(2772) CPSC's Web Site: <http://www.cpsc.gov>

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OR ACCEPTED BY THE COMMISSION

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Briefing Memo



UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MARYLAND 20814

This document has been electronically
approved and signed.

Memorandum

Date: April 16, 2013

TO: The Commission
Todd A. Stevenson, Secretary

THROUGH: Kenneth R. Hinson, Executive Director
Stephanie Tsacoumis, General Counsel
Robert J. Howell, Deputy Executive Director for Safety Operations

FROM: DeWane Ray, Assistant Executive Director
Office of Hazard Identification and Reduction

Rana Balci-Sinha, Ph.D., Project Manager
Division of Human Factors, Directorate for Engineering Sciences

SUBJECT: Notice of Proposed Rulemaking (NPR) for Carriages and Strollers

I INTRODUCTION

The Danny Keysar Child Product Safety Notification Act, section 104 of the Consumer Product Safety Improvement Act of 2008 (CPSIA), requires the U.S. Consumer Product Safety Commission (CPSC or Commission) to: (1) examine and assess voluntary safety standards for certain infant and toddler products, and (2) promulgate mandatory consumer product safety standards that are substantially the same as the voluntary standards or more stringent than the voluntary standards if the Commission determines that more stringent standards would further reduce the risk of injury associated with these products. The list of products in section 104 includes strollers.

Section 104 of the CPSIA also requires the Commission to consult with representatives of consumer groups, juvenile product manufacturers, and independent child product engineers and experts to examine and assess the effectiveness of the voluntary standards. This consultation process commenced in January 2011, with staff participation in a task group within ASTM International Subcommittee F15.17 – Carriages, Strollers, Walkers and Stationary Activity Centers.

This briefing package reviews the incident data associated with strollers; assesses the effectiveness of the current voluntary standard for strollers; discusses the impact of staff's recommendations on small businesses; reviews recent recalls associated with strollers; and presents to the Commission staff's draft proposed rule to address potential hazards.

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OR ACCEPTED BY THE COMMISSION

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II BACKGROUND

A. Product Review

ASTM F833-13, *Standard Consumer Safety Performance Specification for Carriages and Strollers*, defines a “stroller” as a wheeled vehicle to transport children, usually from infancy to 36 months of age (Figure 1). Children are transported generally in a sitting-up or semi-reclined position. The motive power is supplied by a person moving at a walking rate while pushing on a handle attached to the stroller. “Carriages,” on the other hand, are wheeled vehicles used to transport an infant usually in a lying down position (Figure 2). Thus, the principal difference between strollers and carriages is the position of the occupant. Some products can be used as both strollers and carriages (convertible carriages/strollers). ASTM F833 covers strollers, carriages, and convertible carriages/strollers. The proposed rule that the staff recommends would also cover all of these product types. Thus, throughout the briefing package, the requirements discussed cover all these product types wherever applicable.

Both carriages and strollers may be capable of being folded for storage. Umbrella strollers are lightweight, compact when folded, and may lack certain accessories, such as baskets underneath the seat, or cup holders for the caregiver (Figure 3). Strollers that fold in two dimensions, the height and length, are called “2D” strollers (Figure 1). Strollers that collapse in all three dimensions—height, length, and width, are called “3D” strollers (Figure 3)—and result in a smaller folded package than 2D strollers.

Other types of strollers include travel systems that accommodate an infant car seat on a stroller (Figure 4). If a stroller is intended to be used at a jogging rate, then it is called a jogging stroller (Figure 5). Convertible carriages/strollers are intended to be converted by the owner to be used as a carriage or a stroller (Figure 6). Some strollers incorporate automatic or assisted folding and unfolding mechanisms.

Strollers may accommodate more than one child. Side-by-side strollers allow two or more children to sit next to each other in individual seats (Figure 7). Tandem strollers allow two or more children to sit one behind another (Figure 8). Multiple-occupant strollers, which are often used in day care situations, are also available for private consumer use and can accommodate up to 10 occupants (Figure 9). Sit and stand or stand and ride strollers may accommodate children in various sitting or standing positions (Figure 10).



Figure 1. 2D Stroller



Figure 2. Carriage



Figure 3. 3D Umbrella Stroller



Figure 4. Travel System



Figure 5. Jogging Stroller



Figure 6. Convertible Stroller



Figure 7.
Side-by-side
Stroller



Figure 8.
Tandem Stroller



Figure 9.
Multiple-occupant Stroller



Figure 10.
Sit & Stand Stroller

B. Incident Data¹

CPSC staff is aware of a total of 1,207 incidents (4 fatal and 1,203 nonfatal) related to strollers that were reported to have occurred from January 1, 2008, through December 31, 2012 (see Tab A). There have been only a few incidents with no reported injuries associated with carriages, and CPSC staff has not identified any carriage-specific hazards.

The age range, where reported and known² for the data extracted, includes children 4 years old or younger. Because reporting is ongoing, the number of reported fatalities, nonfatal injuries, and noninjury incidents may change in the future.

¹ The CPSC databases searched were the In-Depth Investigation (INDP) file, the Injury or Potential Injury Incident (IPII) file, and the Death Certificate (DTHS) file. These reported deaths and incidents are not a complete count of all incidents that may have occurred during this time period. However, they do provide a minimum number of deaths and incidents occurring during this time period and illustrate the circumstances involved in the incidents related to strollers. All data coded under product codes 1522 and 1505 were extracted from CPSC epidemiological databases. With the exception of incidents occurring at U.S. military bases in foreign countries, all incidents occurring outside of the United States have been excluded. All incidents where a hazardous environment in and around the stroller/baby carriage resulted in fatalities, injuries, or near-injuries were considered to be in scope.

² Incidents with unknown age include either a potential hazard to children or a reported injury to a child.

1) Fatalities

A total of four stroller-related fatalities were reported to have occurred from January 1, 2008 through December 31, 2012. Two of the incidents were related to clearance issues; in the first fatal incident, a 5-month-old infant's head became entrapped between the seat and tray. In the second incident associated with clearance, a 5-month-old infant's head was wedged between the car seat of a travel system and a metal bar located under the cup holder. In the third incident, the stroller collapsed onto a 4-year-old child, resulting in compressional asphyxiation. The fourth incident, in which a stroller fell off of a dock and into a bay resulting in drowning, lacks sufficient details to determine if it was product related.

2) Nonfatal Incidents

A total of 1,203 stroller-related, nonfatal incidents were reported to have occurred from January 1, 2008 through December 31, 2012. Of these, 359 incidents resulted in an injury. Seventy-two of the nonfatal injuries were related to hinges; wheel-related issues resulted in 52 reported injuries; while locking mechanism failures were associated with 42 reported injuries.

A total of 70 incidents resulted in moderate and severe injuries, such as lacerations requiring stitches, tooth extractions, fractures, head injuries, and partial amputations of fingers.

C. National Injury Estimates³

There were an estimated total of 46,200 injuries (sample size=1,870, coefficient of variation=0.16) related to strollers that were treated in U.S. hospital emergency departments from January 2008 through December 2011. Until National Electronic Injury Surveillance System (NEISS) data for 2012 is finalized, partial estimates for 2012 are not available. There was no statistically significant increase or decrease observed in the estimated injuries from one year to the next; nor was there any statistically significant trend observed over the 4-year period from 2008 through 2011.

D. Hazard Patterns

CPSC staff considered all of the 1,207 non-NEISS reported incidents to identify hazard patterns associated with strollers. The hazard patterns were grouped into the following categories:

1. **Wheel issues** were the most commonly reported hazard with a total of 429 incidents. The major hazard patterns included broken wheel rims, wheel detachments, and a burst tire. A total of 52 injuries were reported including two hospitalizations due to falls, resulting in a bone fracture and a head concussion.

³ The source of the injury estimates is the National Electronic Injury Surveillance System (NEISS), a statistically valid injury surveillance system. NEISS injury data are gathered from emergency departments of hospitals selected as a probability sample of all the U.S. hospitals with emergency departments. The surveillance data gathered from the sample hospitals enable CPSC staff to make timely national estimates of the number of injuries associated with specific consumer products.

2. ***Parking brake problems*** related to parking brake failure or assembly resulted in 132 incidents, including eight injuries. Incidents typically occurred when the parking brakes were assumed to be engaged after setting them, but the stroller rolled away and struck an object.
3. ***Lock mechanism issues*** resulting in unexpected collapse of the stroller accounted for 121 incidents. One fatality was reported where the partially erected, unlatched stroller collapsed onto the child when he climbed into the seat, resulting in compressional asphyxiation. A total of 42 injuries were reported in this category, including two hospitalizations, one due to a fall resulting in a skull fracture and the second due to the collapse of the stroller resulting in an amputated finger.
4. ***Restraint issues***, such as the child unbuckling the restraint, restraint breakage or detachment, and restraints that were too loose, were reported in 83 incidents resulting in 29 injuries.
5. ***Hinge issues*** were reported in 75 incidents, resulting in 72 injuries involving both 2D and 3D strollers. This is the highest injury rate of any stroller hazard category. Most of the hinge-related injuries occurred when a caregiver was unfolding the stroller for use and the child was climbing into the stroller. Reported injuries involved pinched, lacerated, or amputated fingers or arms, including one hospitalization.
6. ***Structural integrity-related issues***, such as failure or malfunction of various structural components (*e.g.*, frame, attachment points for the seat, and footrest), resulted in 63 incidents. A total of 16 injuries were reported in this category, including one hospitalization due to a fall resulting in bleeding gums.
7. ***Stability/tip-over*** issues resulted in 58 incidents, including 24 reported injuries involving mostly falls.
8. ***Clearance issues*** involving the space between certain components of a stroller, such as seat and handlebar, basket, canopy, tray, or frame, between the footrest and wheel, or between the car seat and handlebar, resulted in 38 incidents, including 19 injuries. Two fatalities were reported in this category. In the first incident, a 5-month-old victim's head was trapped between the edge of the car seat and the metal bar located under the cup holder. In the second incident, a 5-month-old child had his head trapped in the opening between the stroller seat and tray.
9. ***Car seat attachment-related issues***, including car seats detaching, not locking, or tipping over, resulted in 35 incidents. Most of the incidents resulted in no injury, and five resulted in minor injuries, such as bumps.
10. ***Canopy-related issues*** were involved in 24 incidents and resulted in 18 injuries. Sixteen injuries were due to canopy folds, where a child's finger was caught. One injury required hospitalization in which a child's amputated finger was reattached. Other hazards included cords that are attached to canopies, resulting in a strangulation hazard and attachments with sharp edges or small parts.

11. **Handlebar** issues were involved in 21 incidents that resulted in seven injuries. One injury required hospitalization after a child's finger got caught in a reversible handle hinge and was amputated. Eleven incidents were a result of broken handlebars.
12. **Seat**-related issues, such as seat fabric tearing, resulted in 19 incidents, including 4 injuries.
13. **Sharp points or edges** resulted in 18 incidents with 16 injuries.
14. **Tray**-related issues, such as breakage, detachment, or malfunction, resulted in 14 incidents, including 11 injuries, eight involving fingers.
15. **Consumer complaints** included five reports with no incidents/injuries.
16. **Miscellaneous** problems, including strap detachment, logo detachment, rust, lead, tearing material, and jump seat detachment, were involved in 40 incidents, including 15 with reported injuries. In 15 of the 40 incidents, a child was choking on a toy accessory or tag that had been removed from the product. Five of the injuries occurred due to unexpected detachment of jump seats while in use.
17. **Unspecified category** included stroller-related incidents lacking sufficient information to determine the cause. There were 32 reported incidents in this category, including 21 injuries and one death. The fatal incident involved a stroller falling off a dock and into the bay, which resulted in the victim drowning. There were two hospitalizations. The first incident involved a child falling into a lake while strapped in his stroller resulting in near-drowning; and the second involved a child falling off his stroller at his home.

In some cases, older children (5 years of age or older) and adults also got injured on strollers. Strollers are not self-propelled and remain stationary until pushed by a person other than the occupant. Caregivers are also involved in setting up the stroller (*e.g.*, fold, unfold, remove from trunk, and pump air to the tire). This involvement requires a different set of interactions with the stroller and poses various risks. There were 78 reported stroller incidents that involved children older than 4 years of age and adults; 20 of these injuries were moderate and severe. Out of 78 incidents, 72 involved victims between 17 and 64 years of age. Seventy-four incidents resulted in injuries, mostly to the fingers.

E. History of ASTM F833, Standard Consumer Safety Performance Specification for Carriages and Strollers

The primary voluntary standard in the United States for strollers is ASTM F833, *Standard Consumer Safety Performance Specification for Carriages and Strollers*. This consumer safety specification establishes safety performance requirements, test methods, and labeling requirements to minimize the hazards to children presented by carriages and strollers.

ASTM first published a consumer product safety standard for strollers in 1983. It has been revised 20 times in the past 29 years, with six revisions in the past 5 years. By the end of 2008, the majority of the *general requirements* were in place, including the following:

- Latching mechanisms must resist unintentional folding when a 45 lb. force is applied five times in an attempt to fold the product without releasing a latch;
- Toy accessories must meet the requirements of ASTM F963, *Standard Consumer Safety Specification for Toy Safety*; and
- Several general requirements common to ASTM standards, including: hazardous points and edges; small parts; paint and surface coatings; wood being smooth and free of splinters; holes and slots that could trap a child's finger; exposed coil springs; warning label permanency; and retention of protective components.

The eight *performance requirements* contained in ASTM F833-08 were:⁴

- 6.1) *Parking Brake* - A parking brake must be provided and the braked wheels shall not rotate more than 90° when tested on a 12° incline.
- 6.2) *Static Load* - A stroller shall support a weight of 100 lbs. or 2.5 times the manufacturer-recommended maximum weight in each individual seating area. A combination unit of a car seat on a stroller must support a 50-lb. weight in the car seat when it is attached.
- 6.3) *Stability* - The product with a 17-lbm. CAMI dummy shall not tip over when placed on a 12° incline and shall not tip forward when a 40 lb. force is applied downward where a child would likely step to climb into the stroller.
- 6.4) *Restraining System* - A three-point restraint system (waist and crotch) must be present and may not detach, nor may the adjusting elements permit slippage more than 1 in. when tested.
 - a. Apply 45-lb. force to each anchoring point.
 - b. Insert CAMI infant dummy, secure restraints, and pull a leg with 45-lbs. of force five times.
- 6.5) *Occupant Retention* - A wall surrounding all sides above the floor of the occupant space shall not permit the passage of a 3-in. diameter probe.
- 6.6) *Combination Unit of a Car Seat on a Stroller* - This section lists the specific requirements combination frame/car seat products must meet to eliminate omissions due to differing interpretations of the standard.
- 6.7) *Impact Test* - The product shall not become damaged, and the car seat may not become completely separated from the frame, with 40 lb. (or maximum recommended weight) secured by the restraint system in each seating area, then allowed to roll 40 in. down a 20° slope into a rigid steel stop.
- 6.8) *Passive Containment/Foot Opening* - Products with a tray or grab bar in front of the occupant that creates an opening that could potentially trap a child's head are not permitted. If the opening permits the passage of a 3.0 in. x 5.5 in. torso probe, it must also permit the passage of an 8.0-in. diameter head probe sphere.

Modest changes were made from 2008 through 2011. In addition to editorial alterations and clarifications, the 2009 revision (F833-09) excluded self-propelled products, such as tricycles with push handles. The next revision published in May 2010 (F833-10), added rotating seats to the stability test, and more importantly, made the impact test more stringent. In addition, the

⁴ These are brief summaries of the requirements and associated tests as of 2008. Please see ASTM F833-08 for complete details.

detachment of *any* car seat attachment point from a stroller frame would constitute a failure of the impact test. The 2011 version of the standard added a requirement specifying the text size for instructional literature warnings.

F. Recent Changes to ASTM F833

CPSC staff worked with ASTM stakeholders in task groups to develop new requirements and improve certain requirements to address the hazards identified in the incident data.

ASTM has issued four Section F15⁵ ballots since December 2011,⁶ with a total of 25 stroller-related items on these ballots. These various ballot items address the most severe or frequent hazard patterns identified by CPSC staff. The current version of the standard ASTM F833-13⁷ includes the following changes and additions:

1. An improved test method for the parking brake requirement.
2. A new requirement and test method to address head entrapment hazards associated with a car seat on a stroller (combination unit).
3. A new requirement, test method, and warnings to address wheel and swivel assemblies' detachment.
4. An improved test method for latching and locking mechanisms.
5. A new requirement and test method to address the scenario of the child releasing the buckle of the restraint system and a clarification of the closing system.
6. A new requirement and test method to address pinching, shearing, and scissoring at the saddle hinge link on 3D folding strollers.
7. A new requirement and test method to address pinching, shearing, and scissoring at the canopy hinges.
8. An improved requirement and test method to address multiple seats facing different directions, such as rotating seats, to address stability issues.
9. A new requirement and test method to address strangulation hazards associated with cords and straps within the occupant space.
10. Refinements in warning label contents.

G. International Standards

In Tab B, staff compared the performance requirements of ASTM F833-13 to the performance requirements of other standards, including those from Canada, the European Union, and Australia/New Zealand.

⁵ ASTM Section F15 is the ASTM committee responsible for all consumer product safety standards.

⁶ Ballot (11-09) was open from December 12, 2011 to January 13, 2012, and included 11 items for F833. Ballot (12-04) was open from May 10, 2012 to June 12, 2012, and included five items for F833. Ballot (12-07) was open from September 14, 2012 to October 14, 2012, and included six items for F833. Ballot (13-01) was open from January 27, 2013 to February 27, 2013, with three items for F833.

⁷ ASTM F833-13 was approved by ASTM International (formerly known as the American Society for Testing and Materials) on April 1, 2013 and published on April 16, 2013.

Strollers and carriages are regulated products in Canada and must meet the requirements published by Health Canada in April 1985, SOR/85-379, *Carriages and Strollers Regulations*. Of particular interest is that their regulation has no requirements addressing head entrapment or buckle release, but their restraint system strength requirements are more severe than those in ASTM F833-13.

The stroller standard in Europe, published in March 2012, is EN 1888:2012, *Child care articles – Wheeled child conveyances – Safety requirements and test methods*, and it also has no requirements addressing head entrapment or buckle release. It employs fatigue tests in several places to evaluate the durability of attachment points and locks/latches.

The standard that covers stroller safety in Australia and New Zealand, AS/NZS 2088:2009 *Prams and strollers—Safety requirements*,⁸ was published on December 14, 2009. AS/NZS 2088 is a very thorough and stringent stroller standard. However, AS/NZS 2088 has no head entrapment test or a dynamic scissoring, shearing, and pinching test. This standard also employs fatigue tests to evaluate the durability of attachment points and locks/latches, similar to those found in EN 1888.

Staff believes that the current ASTM F833-13 standard is the most comprehensive of the standards to address the incident hazards. Nevertheless, some individual requirements in international standards are more stringent than F833-13. The current hazard pattern identifications based on the data reported to CPSC do not necessitate adopting these more stringent requirements; however, staff will continue to monitor hazard patterns and recommend future changes, if necessary.

III DISCUSSION

A. Adequacy of ASTM F833-13 Requirements

Staff believes that ASTM F833-13 addresses the majority of the hazards identified in the incident data. This section discusses how each hazard pattern described in Section II-D relates to the current voluntary standard ASTM F833-13.

1) *Wheel Issues*

A new performance requirement to address the wheel detachment hazard pattern is included in ASTM F833-13. This is the first requirement that verifies the strength with which wheels are attached to the stroller. A wheel detachment test is applied to non-swivel wheels and swivel wheels, as well as to the wheels that are intended to be detached from a removable wheel fork assembly. A new warning label is also required on the front wheel fork, alerting the user to a possible tip-over hazard if the wheel is not attached securely. In addition, new warning labels are required for three-wheeled strollers, if the front wheel is intended to be locked during running, jogging, or walking fast.

⁸ AS/NZS 2088:2009, “Australian/New Zealand Standard: Prams and strollers—Safety requirements,” Council of Standards Australia & Council of Standards New Zealand, December 14, 2009.

2) Parking Brakes

CPSC staff and ASTM developed and validated a modified performance requirement and associated test to address weak parking brakes. The improved requirement, approved by ASTM and included in ASTM F833-13, increases both the applied force (by approximately 50%) and the number of repetitions, resulting in a more stringent parking brake system performance requirement. The changes are described in detail in Appendix A of Tab B.

3) Lock Mechanism

A more stringent performance requirement developed by CPSC staff and ASTM is now included in ASTM F833-13. It requires the successful completion of a test that applies a force to the handle bars in a direction likely to break and disengage the folding latch system. The details of the test method are explained in Appendix A of Tab B. Staff believes that the updated requirement will significantly reduce the hazard associated with weak lock/latch mechanisms.

4) Restraint

The requirements included in the ASTM standard prior to the 2013 version addressed restraint system breakage, detachment, and poor fit failure modes. ASTM F833-13 added a new requirement to reduce the ability of a child to escape by unbuckling the harness straps (see Appendix A of Tab B for details). The new requirement states that the buckle shall have either a single-action release mechanism that does not release at a force less than 9 lbf., or a double-action release mechanism. This requirement is similar to requirements for other children's products.

5) Hinges

The highest injury rate of any stroller hazard category arises from scissoring, pinching, or shearing at the hinge link of 2D and 3D strollers. Even though certain pinching and shearing hazards are addressed in the previous versions of the standard, this requirement applies only after the stroller is erected and secured. Incident data show that the majority of the injuries occurred when the stroller was partially erected; therefore, a new requirement addressing the hazard during the unfolding action had to be developed. ASTM F833-13 now includes a requirement addressing the 3D fold strollers (see Appendix A of Tab B for details), but it still fails to address 2D fold strollers. A performance requirement and test method similar to the 3D fold stroller requirement and test method have been developed by CPSC staff and ASTM to address 2D fold strollers. The proposed language has been balloted several times. Staff recommends modifying ASTM F833-13 by incorporating the most recently balloted language (ASTM F15 (13-01) Item Number: 006), shown in Appendix A and adding the language to the proposed rule to address adequately the hinge link hazard.

6) Structural Integrity

ASTM F833-13 contains performance requirements that contribute to the general evaluation of structural integrity. These requirements include latching mechanisms, parking brake requirements, static load, stability, restraining system, and impact test. A stroller must remain operational and not break after the performance requirement tests are performed. Staff believes

that the current requirements associated with structural integrity are sufficient, and therefore, staff does not recommend any further changes at this time.

7) Stability/Tip over

Performance requirements associated with stability have been strengthened in ASTM F833-13 to account for strollers that have rearward or swiveling seats that can face multiple directions. In addition, testing for stability requirements has been modified so that the test is executed in the most severe manner possible, resulting, staff believes, in a more stringent stability performance requirement.

8) Clearance

In addition to the preexisting requirement associated with evaluating the gap between the seat and front tray to prevent head entrapment, ASTM F833-13 requires a new entrapment test with a car seat on a stroller or convertible carriage/stroller. This additional requirement addresses the fatality scenario in which a child was found suspended between the foot end of a car seat and the cup holder tray. Staff believes that the performance requirement and the test methodology are adequate.

9) Car Seat Attachment

ASTM F833-13 requires combination units to meet general requirements associated with latching, parking brakes, static load, and stability and tip over. Staff evaluated various combination units to assess qualitatively the severity of the tip-over test. Both injury rate and severity of injuries are low; therefore, staff will continue to monitor incoming incident reports but does not recommend further action at this time.

10) Canopy

ASTM F833-13 includes a new performance requirement developed by CPSC staff and ASTM stakeholders to address scissoring, shearing, and pinching hazards caused by canopy pivots. In addition, the standard incorporates a new performance requirement to address strangulation hazards associated with cords and straps within the "occupant space," by eliminating cords or straps that can create a hazardous loop. Appendix A of Tab B describes both of these new requirements in detail.

11) Handlebar

The structural integrity of handlebar hinges and latches, the strength of the metal frame, and handle grip structural integrity are addressed with the improved latch performance requirement in ASTM F833-13. Staff does not recommend any further action at this time.

12) Seat

The separated seam failure mode is addressed by ASTM F833-13 with the static load performance requirement. This requirement states that the seat shall support 100 lbs. or 2.5 times the manufacturer's recommended maximum weight, whichever is greater. Staff does not recommend any further action at this time.

13) Sharp Points or Edges

Sharp points and edges are addressed in ASTM F833-13 general requirement 5.1, which states: “there shall be no hazardous points or edges” on the product when first assembled and after all of the other tests in the standard are performed. Staff believes this is sufficient, and therefore, staff does not recommend any further action to address sharp points and edges at this time.

14) Tray

Most of the incidents associated with trays involve pinch hazards with the closing motion or gaps that entrap small fingers. ASTM F833-13 does not specifically address scissoring, shearing, and pinching hazards due to tray articulation, latching, and locking. It does include a general requirement for openings. Staff will monitor the incoming incident data and recommend further action if necessary.

15) Miscellaneous

The choking hazards are addressed by ASTM F833 via the small parts prohibition section, labeling section, as well as the toy accessories requirement. Jump seat or toddler seat detachment incidents involving two manufacturers have been addressed via compliance actions.

16) Unspecified

Staff does not have sufficient information on the hazard patterns for these incidents to recommend any performance changes to the existing standard.

17) Older Children and Adults

The requirements added to or improved in ASTM F833-13, combined with the staff-recommended changes, will address nearly half of the adult injury hazard patterns. Staff will continue to monitor the incident data and recommend further action if necessary.

B. Staff’s Recommendations for the Proposed Safety Standard

Staff recommends that the Commission incorporate by reference ASTM F833-13 as the proposed mandatory safety standard for strollers and carriages, with one modification, which is discussed below:

Adding a new performance requirement and test procedure to address scissoring, shearing, and pinching hazards associated with 2D fold strollers.

CPSC staff and the ASTM task group developed and validated the proposed additional requirement, which went through several ballots. The proposed requirement and test are functionally equivalent to those developed for saddle hinges and are contained in ASTM Ballot F15 (13-01) Item 6 (see Appendix A). The new requirement states that the frame folding action of a stroller shall not create a scissoring, shearing, or pinching hazard when tested. The new test is dynamic, just like the saddle hinge test; and the test also checks to see if the hazard exists with the same two probes while the stroller is moved from a partially to the fully erect and locked position. Based on the incident data and anthropometric dimensions of the child occupant, staff with the ASTM task group defined an “access zone” that is easily accessible by a child. All hinges that are within the access zone, therefore, must be checked for a scissoring, shearing, or

pinching hazard while the stroller is moved from a partially to a fully erect and locked position. Staff believes that ASTM F833-13, combined with the 2D fold requirement, should significantly reduce the risk associated with hinges.

C. Compliance Recalls

Between January 1, 2008 and December 31, 2012, there were 29 recalls involving 6.82 million strollers and 15 different firms. The reasons for the recall actions included strangulations, finger amputations, brake failures, choking hazards, and fall hazards. Tab D contains a chart detailing these recalls.

D. Considerations Regarding the Effective Date for the Final Rule

Staff received a letter (Appendix B) from JPMA (Juvenile Products Manufacturers Association) in April 2012, asking for an effective date of 24 months following publication of the stroller and carriage final rule. In the letter, JPMA refers to various concerns, including retailer impact, product development schedules, and the impending, but not yet finalized modifications to the standard. Two product development timelines included in the JPMA letter range from 17.3 to 19.5 months.

The ASTM balloting process in February 2013 generated more recent comments regarding the effective date. Several manufacturers commented on the need for additional time to address the significant design and development redesign implementation that will be needed to meet the requirements of the standard. All of these commenters now request 18 months.

Staff notes that there may be suppliers who are not aware of the ongoing standard development work within ASTM task groups, and consequently, also were unaware of the modifications in ASTM F833-13 until it was published. Staff also acknowledges that the considerable number of modifications that were made to the latest revision of the standard, combined with the complexity of stroller designs, may require a longer-than-usual implementation time. In response to the manufacturers' recent comments seeking an 18-month effective date, staff recommends that the Commission propose an effective date of 18 months following publication of the final rule, to allow sufficient time for manufacturers and retailers to meet the requirements in the proposed rule. Staff also requests comments on the impact of such an effective date.

E. Initial Regulatory Flexibility Analysis

The majority of strollers and carriages are produced and/or marketed by juvenile product manufacturers and distributors. CPSC staff estimates that currently, there are at least 86 suppliers of strollers to the U.S. market. Based on U.S. Small Business Administration guidelines, 51 are small firms—26 domestic manufacturers, 22 domestic importers, and three firms with unknown supply sources—which are likely to be affected by the staff-recommended proposed standard, as described in the Directorate for Economic Analysis memorandum (Tab F).

The direct impact on the 19 small domestic manufacturers whose strollers meet the current voluntary standard could be significant in some cases, as could the direct impact on the seven small domestic manufacturers whose strollers are not compliant with the current voluntary standard. The staff-recommended 18-month effective date will help mitigate the impact on small domestic manufacturers. Nevertheless, staff requests public comments on alternative effective dates.

The rule could also significantly impact some of the 22 small domestic importers of strollers, especially if they have low revenues and limited product lines outside of strollers and stroller accessories. Again, however, if the Commission sets an 18-month effective date, this could help these importers by allowing them to spread the costs over a longer time period.

IV STAFF RECOMMENDATIONS

CPSC staff recommends that the Commission publish a notice of proposed rulemaking (NPR) that incorporates by reference the voluntary standard ASTM F833-13, *Standard Consumer Safety Specification for Strollers and Carriages*, with one modification relating to scissoring, shearing, and pinching hazards associated with 2D fold strollers. Staff also recommends that the Commission propose an effective date of 18 months following publication of the final rule, but staff requests comments on the impact of such an effective date.

Appendix A: Recommended Change to ASTM F833-13
(strikeouts show removed text, underline shows added text)

Proposed Change to Standard Consumer Safety Performance Specification for Carriages and Strollers, identical to ASTM F15 (13-01) Item Number: 006 with updated section numbers

3.1.x 2D fold stroller – a stroller that folds the handlebars and leg tubes only in the front-to-back (or back-to-front) direction

5.7 Scissoring, Shearing, and Pinching:

5.7. 4 The frame folding action of a 2D fold stroller and convertible carriage/stroller (not a carriage) shall be designed and constructed so as to prevent injury from scissoring, shearing, or pinching. Scissoring, shearing, or pinching that may cause injury exists when the edges of the rigid parts admit a 0.210-in. (5.33-mm) diameter probe but do not admit a 0.375-in. (9.53-mm) diameter probe when tested in accordance with 7.15. Units with a removable seat that prevent the complete folding of the unit when still attached are exempt from this requirement. Note: The evaluation at any given location is performed with the understanding that the probes are allowed to enter the location from any angle/direction.

7.18 Frame Folding Scissoring, Shearing, and Pinching

7.18.1 Frame folding or folding frame stroller and convertible carriage/stroller evaluation: Place the unit's seatback in the most upright position. Identify and mark the portion of the unit's rigid frame members and hinges that have potential scissoring, shearing, or pinching action during folding of the unit and are within or penetrate the access zone shown in Fig X anywhere within the width of the stroller. All marked portions of the frame shall be evaluated per 7.18.2 or 7.18.3 as applicable. For units that feature two or more folding operations that are able to be carried out independently of each other, each operation must be independently evaluated per the test methods in 7.18.2 and/or 7.18.3 as applicable. This includes all seat-facing positions as recommended by the manufacturer and each occupant position on multiple occupancy units. Tray and front grab bar movements not a result of unfolding operation are excluded from this evaluation.

7.18.2 For units where the front and rear wheels move toward each other during folding - measure the change in distance (see Fig. Y) between the front and rear wheel axle centers when moving from the completely folded to completely erected position. The measurement shall be taken with any swivel wheels in the locked position and in the plane where the axle centerlines are perpendicular to the fore/aft horizontal axis of the stroller. To determine the starting point for testing, start folding the unit from erect to folded/"closed" position until the distance between the wheel axle centers is 2/3 of the total travel distance (see figure Y for an example). From this point check the marked portions identified in 7.18.1 for scissoring, shearing and pinching in accordance with 5.7.4 while moving the stroller from this partially folded position to the fully erect and locked position.

7.18.3 For units where the front and rear wheels axle centers move away from each other or do not change distance during folding - place the unit in a partially erect position so the handle tube is rotated 90 deg. from the fully erect and locked position ~~perpendicular to the front leg tube~~. From this point assess the marked portions identified in 7.18.1 for scissoring, shearing and pinching in accordance with 5.7.4 while moving the unit from this partially folded position to the fully erect and locked position.

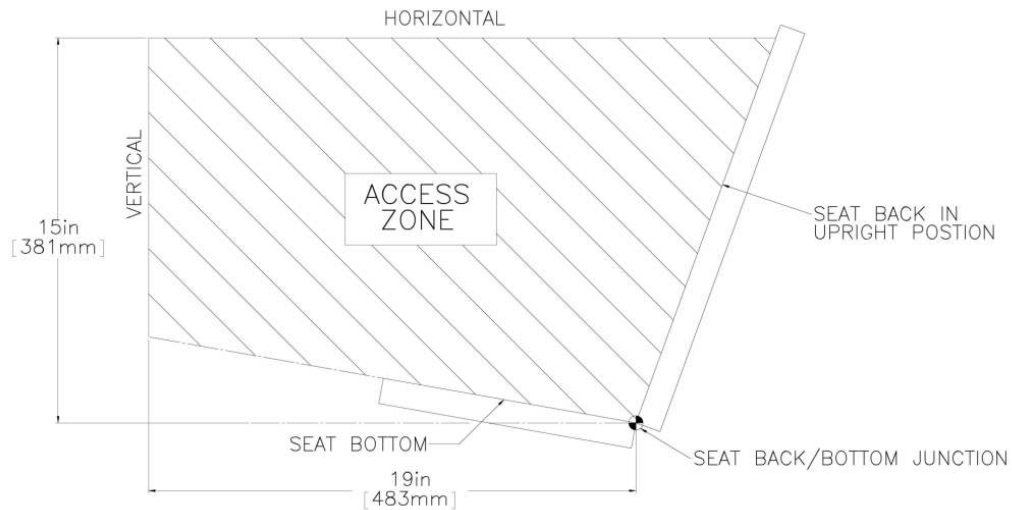


Figure X. Access zone

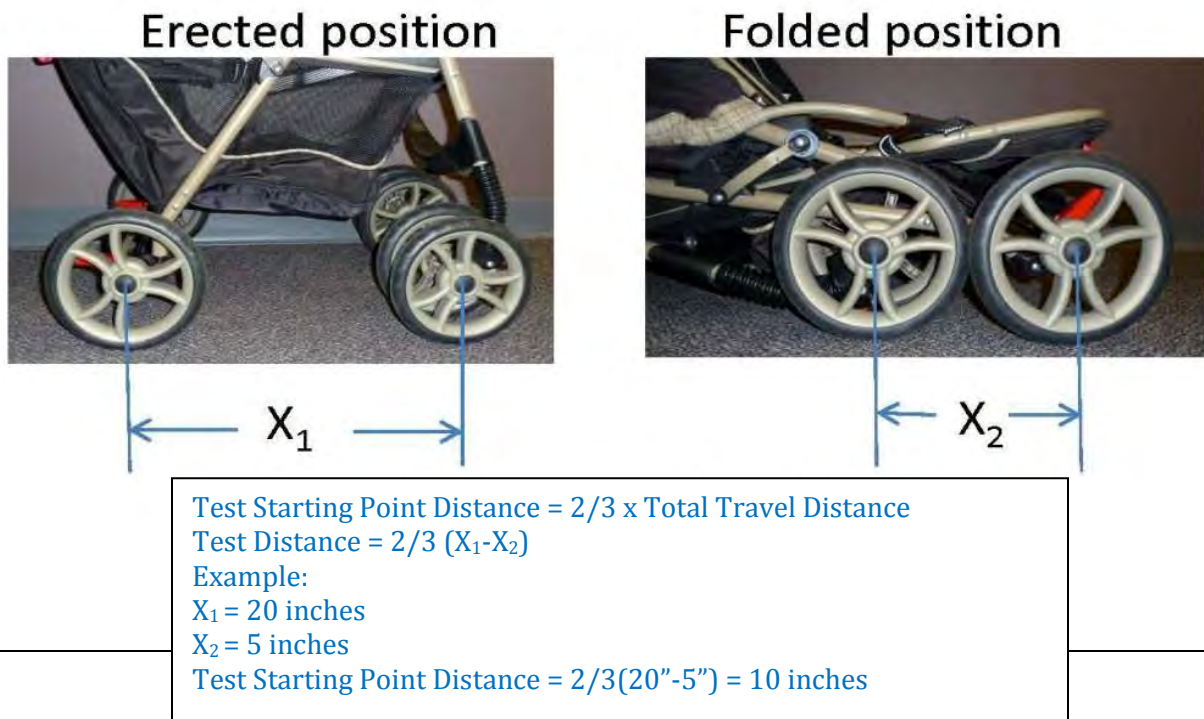


Figure Y. Example of travel distance calculation

Rationale 7.18: A 3 year old child's sitting shoulder height is 15 inches and upper limb length is 19 inches based on 95th percentile 3-year-old child's measurements (Pheasant, S.T. (1996). *Bodyspace: Anthropometrics, Ergonomics and the Design of Work* (2nd ed.). London, UK: Taylor & Francis.). The access zone covers a child sitting in the most upright position reaching forward hence the reason for defining 19" from the seat back junction.

Appendix B- JPMA Letter



April 17, 2012

Jacob Miller
U.S. Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814

RE: Carriages and Strollers Recommended NPR Effective Date

Dear Mr. Miller:

As discussed at a previous stroller task group conference call, this letter supplies the necessary and supporting information you requested to appropriately establish a reasonable effective date for the Carriages and Strollers NPR which is targeted for publication later this year. Discussions thus far for draft NPR requirements include no less than eight substantive changes to the existing and active ASTM standard for ASTM F833 Carriages and Strollers. Given the many changes and their major impact on both existing and new products in development, manufacturers are deeply concerned about the timeline the CPSC staff will recommend for compliance.

In discussing those challenges, I have attempted to categorize the concerns under the following areas; (1) *Timeline Start Date*, (2) *Retailer Impact*, and (3) *Development Schedule and Investment Dollars*.

Timeline Start Date

In any industry that develops products for consumers, the schedule for delivery begins with understanding the scope of the project's requirements. Thus far, the task group has made strong progress in developing five of the eight requirements with an eye on the remaining three. Since these requirements have not been solidified, manufacturers must consider the effective date as published in the final rule of the federal register as the project start date for the following reasons:

- Requirements that are in flux will create confusion amongst those individuals that are attempting to design changes on a moving target. The full extent of additional requirements will not be known until the Final Rule is published.
- Test technicians must clearly understand test methods requirements for equipment purchasing and training.
- Expenses associated with model making can be costly.
- Development on a trial and error basis is both reactive and expensive.

Retailer Impact

Retailers often take a more conservative approach to instituting requirements by implementing them sooner than the published final rule effective date. Additional challenges include:

- Retailers often consider existing inventory that may not comply with the newly published final rule, to be inferior and consequently send existing inventory back to manufacturers for reimbursement. This practice can be costly for manufacturers, so having more time will allow manufacturers to institute changes sooner than later, therefore reducing the potential for high inventory counts, encourage a phase in approach and curtail the potential for inventory return.
- Retailers often request model number changes in order to delineate inventory pre and post standard. This requires manufacturers to change model numbers on product, package, item

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number changes in the database and physical floor model changes. Model number changes result in immediate mark down of merchandise which is charged back to manufacturers. Additionally, changes that are implemented piece meal result in multiple model number changes as requirements become effective. The best solution to this is to assess the most taxing requirement of the eight, determine a reasonable timeline to achieve that requirement and require that all eight become effective simultaneously on that date.

- Only those manufacturers that have been heavily involved with the ASTM process are aware of these potential changes. As a result smaller retailers and manufacturers will have less lead time to digest and fully comprehend these changes effectively reducing their overall time to comply.

Development Schedules and Investment Costs

Evaluation of existing product platforms to draft requirements requires committed resources and time in order to establish a baseline of whether or not existing product platforms conform. This effort requires training stakeholders on the changes to the standards. The audiences include engineers, designers, test technicians and manufacturers. Design solutions require an adequate amount of time to be created and drawn up on paper prior to implementation. Test models must be manufactured to validate design solutions for the changes being considered. Car seat attachments/position, stability, fold geometry, carton size and many other characteristics will need to be thoroughly considered. The full impact of these changes cannot be considered until the requirements have been finalized.

Product presently under development will clearly be impacted. Manufacturers may be in the middle of a long term development cycle with significant dollars already expended on prototyping and tooling. New funding is now required to redesign products. Redirection of human capital is necessary for proper implementation, and opportunity costs are high as people are taken away from product being developed as promised to customers for upcoming seasons. Essentially manufacturers must drop what they are doing and rush to completely brainstorm new designs prior, to hit a fast approaching deadline. Development dollars to and costs associated with new tooling alone may exceed \$300K per product platform. Product teams need to spend weeks at a time at factory sites to test and rush approval.

There are manufacturers with international distribution of product platforms. These manufacturers will need to coordinate platform changes and implementation on a global scale or be forced to abandon global product designs. The European stroller standard EN 1888 is being revised and currently in the voting stage. This alone has added complexity to design of global platforms. Designing product to meet two changing standards is a daunting task.

For these reasons, **manufacturers within the task group recommend that the CPSC staff propose an effective date 24 months from publication of the final rule applicable to product manufactured after such date.** We have included two examples of schedules from separate suppliers that illustrate internal process steps that are necessary to incorporate these changes. We have added approximately 4.5 months to the schedule in anticipation that some of the phase gates will have to be repeated due to issues discovered. The schedules assume perfect execution which is never, ever the case. All of these process steps are required to ensure a safe and compliant product is produced. Deviation or compression of the schedules brings added risk, cost and potentially inferior products. We are eager to continue to work with developing and solidifying the final requirements using the ASTM process but find this to be a major area of importance and we are seeking your support with the recommendation.

We urge you to consider this recommendation in order to appropriately establish a reasonable effective date for the Carriages and Strollers Notice of Proposed Rulemaking.

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Stroller Standard Timeline Schedule A – 519 days (17.3 months)

ID	Task Name	Duration	Start	Finish	Predecessors	Successors
1	Stroller A	518.94d	12/10/2008	12/7/2010		
2	Initial Concept Development	43.94d	12/10/2008	2/9/2009		
3	Initial ID development	16d	12/10/2008	1/1/2009		4
4	Complete 3D models	16d	1/5/2009	1/23/2009	3	
5	Seat prototype	1d	1/23/2009	1/23/2009		6
6	New Year Holiday	7d	1/26/2009	2/2/2009	5	7
7	3D modifications	1d	2/9/2009	2/9/2009	6	9
8	PT1 Prototype	29d	2/10/2009	3/20/2009		
9	Order & source PT1 material	16d	2/10/2009	2/27/2009	7	10
10	Assemble PT1 prototype	3d	3/2/2009	3/4/2009	9	11
11	Review PT1 prototype	4d	3/5/2009	3/9/2009	10	12
12	PT1 Design & 3D modifications	10d	3/10/2009	3/20/2009	11	14
13	PT2 Prototype	33d	3/13/2009	4/28/2009		
14	Order & source PT2 material	9d	3/13/2009	3/23/2009	12	15
15	Assemble PT2 prototype	3d	3/24/2009	3/26/2009	14	16
16	PT2 Static/dynamic test	11d	3/27/2009	4/8/2009	15	17,18
17	PT2 Structure refinement for PT3	5d	4/9/2009	4/14/2009	16	21
18	PT2 Review (Europe)	5d	4/13/2009	4/17/2009	16	19
19	PT2 Review (US)	7d	4/20/2009	4/28/2009	18	
20	PT3 Prototype	38d	4/15/2009	6/5/2009		
21	Order & source PT3 material	12d	4/15/2009	4/28/2009	17	22
22	Assemble PT3 prototype	3d	4/29/2009	5/1/2009	21	24
23	US & EU team in China	8d	5/4/2009	5/13/2009		24
24	PT3 engineering review	4d	5/6/2009	5/11/2009	22,23	25,27
25	PT3 dynamic test	13d	5/8/2009	5/22/2009	24	
26	Ship PT3 sample to US	3d	5/25/2009	5/27/2009	29	28
27	ID updates	12d	5/12/2009	5/27/2009	24	29
28	ID updates & revisions	7d	5/28/2009	6/5/2009	26	
29	Structure & ID refinement on PT4	12d	5/21/2009	6/3/2009	27	26,31
30	PT4 Prototype	94d	6/4/2009	10/13/2009		
31	PT4 CAD model updates	11d	6/4/2009	6/16/2009	29	32
32	Order material for PT4	14d	6/17/2009	7/2/2009	31	33
33	Assemble PT4 proto	6d	7/3/2009	7/9/2009	32	34

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34	PT4 dynamic test	17d	7/10/2009	7/29/2009	33	35
35	PT4 engineering tweaks	9d	7/30/2009	8/11/2009	34	36
36	Ship PT4 to US	3d	8/12/2009	8/14/2009	35	37
37	PT4 usability / canopy review	5d	8/17/2009	8/21/2009	36	38
38	PT4 review approval	0d	8/21/2009	8/21/2009	37	39
39	Ship PT4 to International soft goods team	3d	8/24/2009	8/26/2009	38	82
40	PT4 U.S. engineering review	2d	10/6/2009	10/7/2009	84	41
41	PT4 Issue tracker updates	2d	10/8/2009	10/9/2009	40	42
42	PT4 top 10 issues defined	1d	10/12/2009	10/12/2009	41	43
43	PT4 top 10 issue review w/ Supplier	1d	10/13/2009	10/13/2009	42	45,55
44	PT5 Prototype (qty 2)	47d	9/30/2009	12/3/2009		
45	PT5 CAD model updates (to PT6)	12d	10/14/2009	10/27/2009	43	46
46	MS2 Review	0d	10/15/2009	10/15/2009	45	
47	Order material for PT5	12d	9/30/2009	10/13/2009	83	48
48	Assemble PT5 proto	6d	10/14/2009	10/20/2009	47	49
49	PT5 dynamic test	12d	10/21/2009	11/3/2009	48,98	50
50	PT5 engineering / soft goods review at China	7d	11/4/2009	11/12/2009	49	51,85
51	PT5 review approval	0d	11/12/2009	11/12/2009	50	52,56
52	PT5 model updates	13d	11/13/2009	11/27/2009	51	53
53	Ship PT5 model to UK for safety review	4d	11/30/2009	12/3/2009	52	67
54	PT6 Prototype (qty 2)	119d	10/14/2009	3/30/2010		
55	PT6 CAD model updates	26d	10/14/2009	11/12/2009	43	56,57
56	Order material for PT6 (qty 2)	15d	11/13/2009	11/30/2009	55,51	58
57	Tooling RFQ's based on PT6 updates	6d	11/13/2009	11/19/2009	55	
58	Assemble PT6 proto	6d	12/1/2009	12/7/2009	56	59,60,61
59	PT6 CA validation testing	12d	12/8/2009	12/21/2009	58	
60	Ship PT6 sample to (US)	4d	12/8/2009	12/11/2009	58	62,63
61	Ship PT6 sample to (UK)	4d	12/8/2009	12/11/2009	58	
62	PT6 Soft good, Compliance & FTC testing	16d	12/14/2009	1/5/2010	60	
63	PT6-v2 fabrication (qty 3)	19d	12/14/2009	1/5/2010	60	64
64	Ship PT6-v2 to (UK)	5d	1/6/2010	1/11/2010	63	65,70,71
65	PT6-v2 review	1d	1/12/2010	1/12/2010	64	
66	Regional forecasts compiled	14d	12/8/2009	12/28/2009		68
67	Safety review (updated PT5	1d	12/4/2009	12/4/2009	53	68

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	model)					
68	PDR review	1d	1/15/2010	1/15/2010	66,67	69
69	MS3 Prep - update cost, tool spec sheets & quotes	18d	1/18/2010	2/10/2010	68	74
70	TRU Meeting - Customer Acceptance Review	1d	1/19/2010	1/19/2010	64	
71	Retailer Meeting - Customer Acceptance Review	1d	1/22/2010	1/22/2010	64	72
72	Test lab Compliance Review	4d	1/25/2010	1/28/2010	71	73
73	PT6 Eng Review	7d	1/29/2010	2/8/2010	72	74
74	MS3 Tooling Issue Review	1d	2/10/2010	2/10/2010	73,69	75
75	MS3 Tooling Issue Approval	1d	2/10/2010	2/10/2010	74	76
76	CAR submitted for approval	5d	2/24/2010	3/2/2010	75	77
77	CAR approval issued	1d	3/30/2010	3/30/2010	76	78
78	Tooling PO Issued	1d	3/4/2010	3/4/2010	77	105
79	Soft goods Development	224d	7/1/2009	5/11/2010		
80	International soft good team availability	0d	7/1/2009	7/1/2009		81
81	Research trends & story boards	22d	7/1/2009	7/30/2009	80	82
82	Revise soft goods on PT4 model	20d	8/27/2009	9/23/2009	81,39	83
83	Present concept - TRU feedback	0d	9/30/2009	9/30/2009	82	47,84
84	Fly to USA for PT4 engineering review	1d	10/5/2009	10/5/2009	83	40
85	Fashion + cut & sew samples	14d	11/13/2009	12/2/2009	50	86
86	PT5 fashion & soft goods customer approval	0d	1/19/2010	1/19/2010	85	87
87	Request lab dips 1st issue	10d	1/19/2010	2/1/2010	86	88
88	Fabric / Lab dips approval (TRU)	26d	2/2/2010	3/9/2010	87	89
89	Mini bulk run of fabrics	20d	3/10/2010	4/6/2010	88	90,92
90	Red seal ETA	25d	4/7/2010	5/10/2010	89	91
91	Red seal sample approval (TRU)	1d	5/11/2010	5/11/2010	90	
92	Specs created & finalized	16d	4/7/2010	4/28/2010	89	93
93	T0 Samples fabricated	7d	4/29/2010	5/7/2010	92	94
94	T0 Samples reviewed at China	1d	5/8/2010	5/8/2010	93	95
95	Soft goods initial sample approval	0d	5/8/2010	5/8/2010	94	

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96	Documentation	228d	8/25/2009	7/9/2010		
97	Preliminary product specification	45d	8/25/2009	10/26/2009		98
98	Preliminary product test plan	45d	8/25/2009	10/26/2009	97	49,99
99	Revised product specification	65d	10/27/2009	1/28/2010	98	100
100	Revised product test plan	65d	10/27/2009	1/28/2010	99	101
101	Finalize product specification	5d	6/28/2010	7/2/2010	100,128	102
102	Finalize test plan	5d	7/5/2010	7/9/2010	101	
103	Mold Development Process	199d	3/4/2010	12/7/2010		
104	Mold Engineering	11d	3/4/2010	3/18/2010		
105	Engineering print release	1d	3/4/2010	3/4/2010	78	106
106	Preliminary Mold Design	12d	3/5/2010	3/18/2010	105	107
107	Mold Design Review	10d	3/8/2010	3/18/2010	106	108
108	Mold Build Kick Off	10d	3/8/2010	3/18/2010	107	110
109	Mold Development	44d	3/9/2010	5/7/2010		
110	Mold Build	41d	3/9/2010	4/24/2010	108	111
111	T0 Sample - Mold Function	10d	4/14/2010	4/24/2010	110	112
112	Mold Adjust	3d	4/26/2010	4/28/2010	111	113,115
113	T0 Build (qty 6)	4d	5/3/2010	5/7/2010	112	
114	T1 Engineering Build	15d	5/3/2010	5/21/2010		
115	T1 Sample - Dimension	8d	5/3/2010	5/12/2010	112	116,117
116	Dimensional & Functional Review	5d	5/10/2010	5/14/2010	115	118
117	Mold Adjust	5d	5/10/2010	5/14/2010	115	118
118	T2 Sample - Engineering	1d	5/15/2010	5/15/2010	117,116	#####
119	Initial Engineering T1 build (qty 15)	4d	5/18/2010	5/21/2010	118	121
120	T1 Test & Approval	9d	5/24/2010	6/3/2010		
121	Compliance Testing	5d	5/29/2010	6/3/2010	118,119	125
122	Fit Test	4d	5/24/2010	5/27/2010	118	125
123	Functional Testing	4d	5/24/2010	5/27/2010	118	125
124	EP1 Build	25d	5/24/2010	6/25/2010		
125	Design Change	9d	5/24/2010	6/2/2010	#####	126
126	Mold Adjust	12d	6/1/2010	6/14/2010	125	127
127	T3 Sample - ECN	5d	6/14/2010	6/18/2010	126	128
128	Engineering Prototype (EP)	2d	6/24/2010	6/25/2010	127	#####
129	EP2 Build (Contingency Plan)	25d	6/26/2010	7/31/2010		
130	Design Change	8d	6/26/2010	7/5/2010	128	132
131	Texture tools	13d	6/26/2010	7/10/2010	128	133
132	Tooling modifications	14d	7/6/2010	7/21/2010	130	133
133	Mold & fabricate parts	5d	7/22/2010	7/27/2010	132,131	134

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134	Engineering Prototype 2 (EP2)	2d	7/30/2010	7/31/2010	133	#####
135	EP2 Test & Approval	5d	7/31/2010	8/7/2010		
136	FQC Testing	2d	7/31/2010	8/2/2010	134	
137	Compliance Testing (EN1888)	6d	8/2/2010	8/7/2010	134	
138	Lap Testing	3d	8/1/2010	8/4/2010	134	140
139	EP3 Build	18d	8/5/2010	8/30/2010		
140	EP3 design modifications & testing	4d	8/5/2010	8/9/2010	138	141
141	EP3 tool modifications	10d	8/10/2010	8/20/2010	140	142
142	Mold / Part Approvals	2d	8/21/2010	8/23/2010	141	143
143	Engineering Prototype 3 (EP3)	3d	8/24/2010	8/26/2010	142	#####
144	Ship EP3 Samples	4d	8/25/2010	8/28/2010	143	148
145	Compliance Testing (EN1888)	5d	8/25/2010	8/30/2010	143	150
146	Lap Testing	5d	8/25/2010	8/30/2010	143	150
147	EP4 Build	41d	8/23/2010	10/18/2010		
148	Test Compliance Testing	4d	8/23/2010	8/26/2010	144	149
149	Test Compliance Certificate Issued to Supplier	0d	8/26/2010	8/26/2010	148	150
150	EP4 brake modifications & testing	8d	8/31/2010	9/8/2010	#####	151,158
151	Mold new brake parts (PA6 + glass)	7d	9/9/2010	9/16/2010	150	152
152	Incoming part inspection & material preparation	8d	9/17/2010	9/25/2010	151	153
153	Engineering Prototype 4 (EP4)	2d	9/27/2010	9/28/2010	152	154
154	Ship EP4 Samples	4d	9/29/2010	10/7/2010	153	155
155	Inspect EP4 Samples in Fradley	2d	10/8/2010	10/11/2010	154	156,167
156	Ship EP4 sales samples to regions	5d	10/12/2010	10/18/2010	155	
157	PP Build	37d	9/9/2010	10/29/2010		
158	Brake tool modifications	25d	9/9/2010	10/12/2010	150	159
159	Mold sampling	3d	10/13/2010	10/15/2010	158	160
160	Part runs & inspection	3d	10/16/2010	10/19/2010	159	161
161	Production Pilot Build (PP)	3d	10/20/2010	10/22/2010	160	162,163
162	Compliance Testing	5d	10/22/2010	10/27/2010	161	

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	(EN1888)					
163	Lap Testing	3d	10/22/2010	10/25/2010	161	164,168
164	Test Results Review	1d	10/25/2010	10/25/2010	163	165
165	Mass production risk builds	8d	10/21/2010	10/29/2010	164,168	172
166	MS4 Review & Approval Process	11d	10/12/2010	10/26/2010		
167	Pre-MS4 Review Call	5d	10/12/2010	10/18/2010	155	168
168	Testing Results Review & Approval	1d	10/26/2010	10/26/2010	163,167	165,169
169	MS4 Review & Final Recommendations	1d	10/25/2010	10/25/2010	168	170
170	MS4 Production Approval	0d	10/25/2010	10/25/2010	169	172
171	Initial Shipment Plan	27d	10/30/2010	12/7/2010		
172	Truck departs from factory	1d	10/30/2010	10/30/2010	165,170	173
173	Container packed	1d	11/1/2010	11/1/2010	172	174
174	Container sealed	1d	11/2/2010	11/2/2010	173	175
175	Boat departs	0d	11/7/2010	11/7/2010	174	176
176	Boat in transit	22d	11/8/2010	12/7/2010	175	177
177	Shipment arrives	0d	12/7/2010	12/7/2010	176	

Stroller Standard Timeline – Schedule B – 78 weeks (19.5 months)

Phase	Step	Duration (weeks)	Cumulative Duration (weeks)
Design Engineering & Design Validation	Final Rule for Strollers Published and in Registry	0	
	Initial Engineering	10	10
	Make Model #1 & Modify Soft Goods as Required	4	14
	Evaluate Model #1	2	16
	Engineering - Make Modifications	5	21
	Make Model #2 & Modify Soft Goods as Required	4	25
	Evaluate Model #2	2	27
	Final Engineering	5	32
	Make Tooling Model & Modify Soft Goods as Required	3	35
	Evaluate & Approve Tooling Model	2	37
	Tool Start	0	37
Tool, Debug, & Qualify	Make Tooling Drawings	2	39

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	Make Tools	10	49
	Make Engineering #1 Pilot Samples	2	51
	Evaluate Engineering Pilot #1 Samples	2	53
	Make Engineering #2 Pilot Samples	3	56
	Evaluate Engineering Pilot #2 Samples	2	58
	Make Final Engineering Pilot Samples	3	61
	Evaluate Final Engineering Pilot Samples	2	63
	Make Production Pilot Samples	3	66
	Evaluate Production Pilot Samples	2	68
	Release To Production	0	68
	Make Production Line Ready	2	70
Produce & Ship	Make Production	4	74
	Ocean Transportation	4	78
	Available in Domestic Ware House	0	78

Again, we urge you to consider this recommendation in order to appropriately establish a reasonable effective date for the Carriages and Strollers Notice of Proposed Rulemaking.

Sincerely,

Michael Dwyer, CAE
Executive Director

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TAB A: Stroller-Related Deaths, Injuries, and Potential Injuries; January 2008–December 2012

**T
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B

A**



**UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MARYLAND 20814**

Memorandum

Date: April 2, 2013

TO : Rana Balci-Sinha, Ph.D.
Stroller Project Manager
Division of Human Factors
Directorate for Engineering Sciences

THROUGH: Kathleen Stralka
Associate Executive Director
Directorate for Epidemiology

Stephen Hanway
Director, Division of Hazard Analysis
Directorate for Epidemiology

FROM : Angie Qin
Division of Hazard Analysis
Directorate for Epidemiology

SUBJECT : Stroller-Related Deaths, Injuries, and Potential Injuries (January 2008–December 2012⁹) and NEISS Injury Estimates (January 2008 through December 2011)

I. Introduction

This memorandum provides the statistics on deaths and injuries, as well as a summary of the types of hazards related to strollers and carriages (products coded 1522 and 1505), for incidents that were reported to have occurred from January 2008 through December 2012.¹⁰ The counts are based on reports received by U.S. Consumer Product Safety Commission (CPSC) staff. The report also includes the estimated number of emergency department-treated injuries from January 2008 through December 2011.

⁹ This analysis was prepared by CPSC staff. It has not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

¹⁰ Not all of these incidents are addressable by an action the CPSC could take. It is not the purpose of this memorandum to evaluate the addressability of the incidents, but rather to quantify the number of fatalities and injuries reported to CPSC staff and to provide, when feasible, estimates of emergency department treated injuries. If the date of incident or injury is not reported, the date entered to CPSC is used.

The ASTM voluntary standard (F833-13) addresses safety issues related to strollers and carriages. According to the ASTM definition, a “stroller” is a wheeled vehicle for the transport of infants or children generally in a sitting-up or semi-reclined position. The motive power is supplied by a person or persons pushing or pulling on a handle attached to the vehicle. A stroller generally is capable of being folded for storage. Strollers normally are used for children from infancy to 36 months of age. For hazard pattern identification purposes, CPSC staff limited the data to incidents reporting the user’s age to be 4 years or younger. Incidents in which the user’s age was unreported or unknown were included. Incidents related to a travel system, which includes a stroller, an infant car seat, and a car seat base, were also included.

II. Incident Data¹¹

CPSC staff received 1,207 reported incidents (four fatal and 1,203 nonfatal incidents) related to strollers that were reported to have occurred from January 1, 2008 through December 31, 2012, and involved children 4 years old or younger (or whose age was unreported/unknown). The reporting is ongoing. The number of reported fatalities, nonfatal injuries, and noninjury incidents may change in the future. Table 1 shows the breakdown of the incidents by severity and age of the victim. Table 2 categorizes incidents by severity and incident year.

Table 1: Distribution of Stroller-Related Reported Incidents 01/01/2008 through 12/31/2012 by Severity and Victim’s Age

Age	Fatalities	Injuries	Non-injuries or injury not reported	Total
Less than 1 year	2	93	141	236
12 to 23 months	1	102	66	169
2 years	0	64	39	103
3 years	0	21	16	37
4 years	1	8	4	13
Not reported*	0	71	578	649
Total	4	359	844	1,207

Source: CPSC epidemiological databases IPII, INDP, and DTHS.

* : Includes incidents where user’s age was unreported/unknown with a reported injury or potential hazard to a child

¹¹ The CPSC databases searched were the In-Depth Investigation (INDP) file, the Injury or Potential Injury Incident (IPII) file, and the Death Certificate (DTHS) file. These reported deaths and incidents are not a complete count of all incidents that may have occurred during this time period. However, they do provide a minimum number of deaths and incidents occurring during this time period and illustrate the circumstances involved in the incidents related to strollers.

All data coded under product codes 1522 and 1505 were extracted from CPSC epidemiological databases. Upon careful joint review with Engineering Science staff, some cases were considered out of scope for the purposes of this memorandum. Cases involving adults or older children who were not the intended users of the stroller are excluded. Examples of such excluded cases are incidental cases, such as falls or strains while pushing or carrying a stroller; tripping over the stroller; or motor vehicle accidents. With the exception of incidents occurring at U.S. military bases in foreign countries, all incidents occurring outside of the United States have been excluded. All incidents where a hazardous environment in and around the stroller/baby carriage resulted in fatalities, injuries, or near-injuries were considered to be in scope.

Table 2: Distribution of Stroller-Related Reported Incidents 01/01/2008 through 12/31/2012
by Severity and Year

Year of incident**	Fatalities	Injuries	Non-injuries or injury not reported	Total
2008	1	59	161	221
2009	0	120	207	327
2010	1	95	142	238
2011	2	41	264	307
2012	0	44	70	114
Total	4	359	844	1,207

Source: CPSC epidemiological databases IPII, INDP and DTHS.

** If the date of incident or injury is not reported, the date entered to CPSC is used.

Note: Data in italics indicates reporting is ongoing for 2009-2012.

A. Fatalities

There were four stroller-related fatal incidents that were reported to have occurred from January 1, 2008 through December 31, 2012. Among the fatal reports, three were product related; two incidents involved a clearance issue, and one involved a locking mechanism failure. In the first incident, the victim's head was entrapped between the stroller seat and tray. In the second incident, the victim's head was wedged between the car seat of a travel system and the stroller handle. In the third incident, the stroller collapsed onto the child. In addition, there was one incident that lacked sufficient information to determine whether it was product related. This incident involved a stroller falling off a dock and into a bay; the child drowned.

B. Nonfatal Incidents

There were 1,203 stroller-related, nonfatal incidents that were reported to have occurred from January 1, 2008 through December 31, 2012. Among them, there were 594 (49%) reports that were submitted to CPSC by retailers and manufacturers through CPSC's: "Retailer Reporting System." The rest were submitted to CPSC through various sources, such as consumers' hotlines and Internet reports, newspaper clippings, and other state/local authorities.

Of the nonfatal incidents, there were 359 injury incidents and 844 noninjury or injury-not-reported incidents. There were 10 incidents where hospitalization was required. Three incidents were related to a stroller collapse, resulting in either a head fracture (one incident) or finger amputation (two incidents). Two incidents involved a wheel detachment, resulting in either a collar bone fracture or a head concussion. One incident involved a stroller seat ejecting from the base, resulting in bleeding gums. One incident occurred when a stroller plunged into a lake while the child was strapped into the stroller. The cause was unclear. One incident involved a child falling out of a stroller and requiring airlift to the hospital with unspecified injuries. In addition, one incident was related to the handle bar, and another was related to a canopy problem; both cases resulted in finger amputation.

III. Hazard Patterns

CPSC staff considered all 1,207 incidents to identify hazard patterns. For most incidents, only one hazard was reported. In cases where multiple hazards were reported, the more severe hazard was used for classification purpose. The stroller-related incidents were grouped into 17 categories based on the hazardous stroller components. They are listed below:

- A. *Wheel*: There were 429 incidents related to wheel problems. This category included cases where the wheel/rim broke, issues with wheel detachment/attachment, issues with the wheel lock or wheel stability, and cases where a tire or tube burst. The majority of these reports (72%) were received from manufacturers and retailers. This category consisted of 52 injuries, including two hospitalizations for a collar bone fracture and a head concussion.
- B. *Parking brake*: There were 132 incidents related to parking brake failure or parking brake assembly problems. The majority of these reports (78%) were received from manufacturers and retailers. This category included 8 injuries.
- C. *Lock mechanism*: There were 121 incidents related to lock mechanical failure, which resulted in the stroller folding up or collapsing unexpectedly. Of those, 39 reports were received from manufacturers and retailers. This category had 42 reported injuries, including two hospitalizations for a skull fracture and an amputated finger. It also included one fatality where the stroller collapsed onto the child, resulting in compression asphyxiation.
- D. *Restraint*: There were 83 incidents related to a restraint problem. This category included restraint failure, breakage or detachment, cases where the restraint was unbuckled by the child, and cases where the restraint was too loose, too long, or not used. There were 29 injuries reported in this category.
- E. *Hinge*: There were 75 incidents related to hinge problems. Among those, there were 72 reported injuries, which involved pinched/lacerated/amputated fingers or arms, including one hospitalization for an amputated finger.
- F. *Structural integrity*: There were 63 incidents related to structural integrity problems. This category included the failure or malfunction of various structural components (including the seat support, frame, cross bar, canopy, footrest, sun shade, umbrella, weld, cap, screw, hub, nut, and other small parts). Sixteen injuries were reported in this category, including one hospitalization for bleeding gums.
- G. *Stability/tip over*: There were 58 incidents related to stability/tip over. Most of these incidents involved no injury, although 24 reported minor injuries, such as bumps and bruises.
- H. *Clearance*: There were 38 incidents related to clearance issues. This category included: clearance between: the seat and the handlebar, basket, canopy, side, tray, or frame; the footrest and the basket or wheel; the car seat of a travel system and the handlebar; and the wheels. Two fatalities were reported in this category. In the first incident, the victim's head was entrapped between the stroller seat and the tray. In the second incident, the victim's head

was wedged between the car seat attachment and stroller handle. This category also included: 19 reported injuries. Involved body parts were the face, neck, back, arm, finger, and foot.

- I. *Car seat attachment*: There were 35 incidents involving a stroller with a car seat adapter, including car seat detachment, inability to lock and tip over. In most cases, there was no injury. However, 5 incidents reported minor injuries, such as bumps.
- J. *Canopy*: There were 24 incidents with canopy-related problems, such as a canopy fold causing finger injuries, cords attached to the canopy causing a strangulation hazard, attachments with sharp edges, and material problems associated with a choking hazard. Eighteen reported incidents involved injuries, including one hospitalization for an amputated finger. Most injuries involved a finger or hand.
- K. *Handlebar*: This category included a breakage, detachment, or malfunction of the handlebar, resulting in six injuries, one hospitalization for an amputated finger, and 14 incidents with no injuries reported.
- L. *Seat*: This category included seat or seat fabric problems. Most of the incidents were related to a seat fabric tear. This category included 19 incidents: 4 injuries and 15 noninjuries.
- M. *Sharp points or edges*: Incident reports in this category included sharp points or edges of various structural components of the stroller, with a total of 16 injuries and two noninjuries.
- N. *Tray*: Incident reports in this category included breaks, detachments, or malfunctions of the tray. This category included 11 injuries and three noninjuries. Most injuries were finger related.
- O. *Consumer complaint*: This category included consumer complaints about the manufacturer's website and complaints that their product resembles a recalled product. A total of five reports with no injuries were included in this category.
- P. *Miscellaneous*: There were 40 incidents with miscellaneous problems and 15 with reported injuries. This category included cases involving a strap detaching or being a choking hazard, logo or accessory detachment, incomplete assembly, rust, lead, cases where the material smells or tears, a lack of warranty information, and a company announcement of a voluntary recall.
- Q. *Unspecified*: There were 32 reports that lacked sufficient information to determine the cause of the incident. There were 10 noninjuries, 19 reported injuries, two hospitalizations, and one death. The fatal incident involved a stroller falling off a dock into a bay. The child drowned. The first hospitalization incident involved a child falling into a lake while strapped in his stroller. The second incident involved a child falling out of a stroller and requiring airlift to the hospital with unspecified injuries.

The distribution of the 1,207 reported incidents by the hazardous components described above is shown in Figure 1.

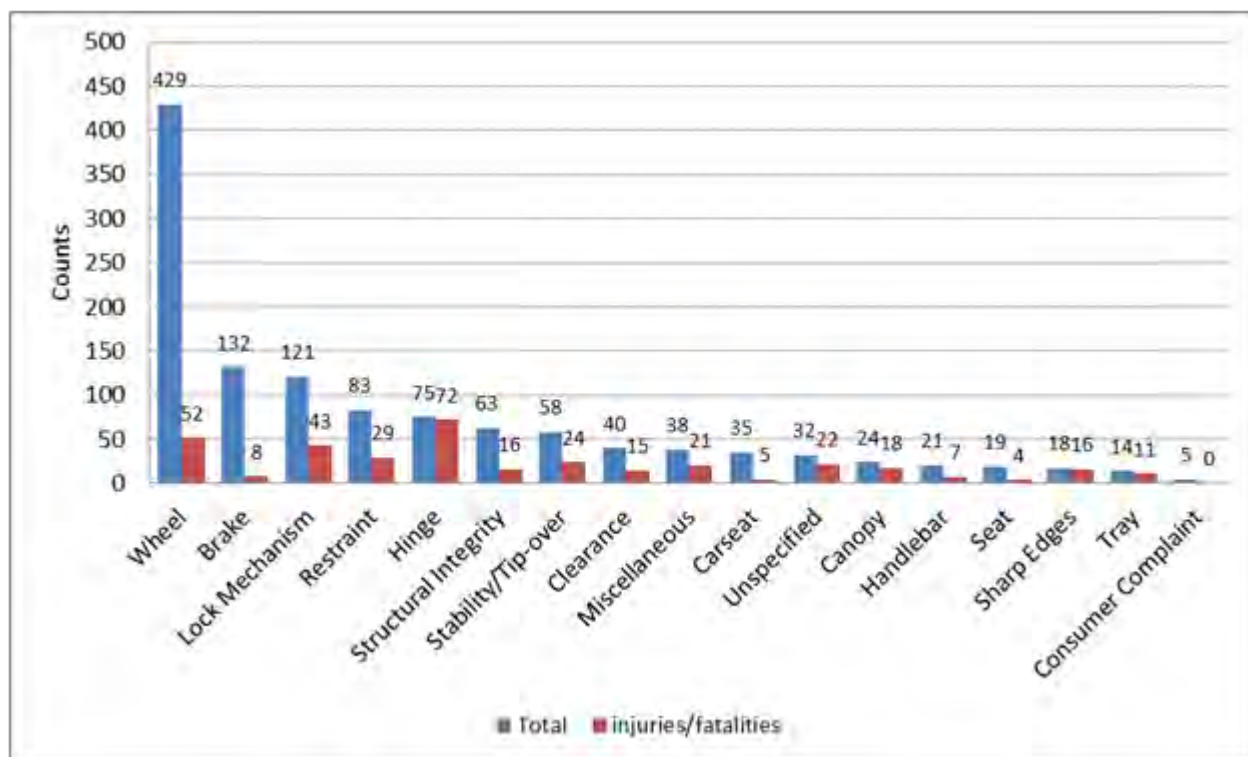


Figure 1: Distribution of Reported Stroller-Related Incidents by Components Presenting the Hazard
(Date of Incidents: January 2008–December 2012)

Source: CPSC epidemiological databases IPII, INDP, and DTHS.

IV. National Injury Estimates¹²

There were an estimated 46,200 stroller-related injuries (sample size=1870, coefficient of variation=0.16) that were treated in U.S. hospital emergency departments from January 2008 to December 2011. The age of the patients in these incidents ranged between 1 month and 4 years old. More than 98 percent of the patients were reported to be 3 years old or younger. Partial estimates for 2012 are not available until NEISS data for 2012 is finalized in spring 2013. There was no statistically significant increase or decrease observed in the estimated injuries from one complete year to the next ($p>0.1$); nor was there any statistically significant trend observed over the 4-year period from 2008 to 2011 ($p=0.81$).

¹² The source of the injury estimates is the National Electronic Injury Surveillance System (NEISS), a statistically valid injury surveillance system. NEISS injury data are gathered from emergency departments of hospitals selected as a probability sample of all the U.S. hospitals with emergency departments. The surveillance data gathered from the sample hospitals enable CPSC staff to make timely national estimates of the number of injuries associated with specific consumer products.

All data coded under product codes 1522 and 1505 for patients age 4 years and under was extracted. Certain records were considered out of scope for the purposes of this memo. Cases involving adults or children over age 4 who were not riding in the stroller are excluded. Cases involving tripping over a stroller, having cardiac arrest in a stroller, or motor vehicle accidents were also excluded. These records were excluded prior to deriving the statistical injury estimates.

No deaths were reported through NEISS. Based on the narratives, most of the incidents were related to falls (*e.g.*, falls from the stroller; falls from climbing on the stroller; falls from stroller tip over; stroller falling down steps). Most of the injuries (94%) were treated and released. The following injury characteristics occurred most frequently:

- Injured body part – head (51%), face (24%), mouth (9%), finger (5%); and
- Injury type – internal organ injury (36%), contusions/abrasions (24%), laceration (18%).

V. Incidents Among Older Children and Adults

There were 78 reported incidents from IPII, INDP, and DTHS related to strollers that were reported to have occurred from January 1, 2008 through December 31, 2012, and involved children older than 4 and adults. They were submitted through retailers and manufacturers, consumer hotlines and Internet reports, newspaper clippings, and other state/local authorities. Six incidents involved children between 5 and 10 years old, and the rest involved victims between 17 and 64 years old. Seventy four incidents reported injuries; of those, 50 incidents involved finger, hand, toe, or leg injuries.

There were 30 reported injuries from NEISS related to strollers that were reported to have occurred from January 1, 2008 through December 31, 2011, and that involved children older than 4 and adults. One incident involved a child between 5 and 10 years old, and the rest involved victims between 13 and 72 years old. Twenty-seven incidents (90%) involved finger or hand injuries.

TAB B: Proposed Changes to the Voluntary Standard for Strollers (ASTM F833-13)–Segue to a Mandatory CPSC Safety Standard for Strollers

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UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
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Memorandum

Date: April 2, 2013

TO : Rana Balci-Sinha, Ph.D.
Project Manager, Stroller Rulemaking Team
Directorate for Engineering Sciences

THROUGH: Andrew G. Stadnik, P.E., Associate Executive Director
Directorate for Laboratory Sciences

FROM : Gregory K. Rea, Director
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SUBJECT : Proposed Changes to the Voluntary Standard for Strollers (ASTM F833-13) –
Segue to a Mandatory CPSC Safety Standard for Strollers

I. BACKGROUND AND OVERVIEW

On August 14, 2008, the Consumer Product Safety Improvement Act (CPSIA) was signed into law [Public Law 110-314]. Section 104 of the CPSIA, the Danny Keysar Child Product Safety Notification Act, requires the U.S. Consumer Product Safety Commission (CPSC, or Commission) to develop safety standards for certain infant and toddler products, including strollers. The CPSIA requires the Commission to assess the effectiveness of the relevant voluntary safety standards and promulgate mandatory standards for these products. Section 104(b)(1)(B) states that – “The Commission shall . . . promulgate consumer product safety standards that – (i) are substantially the same as voluntary standards; or (ii) are more stringent than such voluntary standards if the Commission determines that more stringent standards would further reduce the risk of injury associated with such products.”

The Commission’s Laboratory Sciences Mechanical Engineering (LSM) staff recommends adopting the ASTM International voluntary standard F833-13,¹³ *Standard Consumer Safety Performance Specification for Carriages and Strollers*, with one modification. The modification is to add the previously balloted performance requirement addressing the scissoring, shearing, and pinching hazards associated with 2D fold strollers. LSM staff believes that this modification would result in a more stringent standard and would further reduce the risk of injury associated with strollers.

¹³ ASTM F833-13 was approved by ASTM International (formerly known as the American Society for Testing and Materials) on April 1, 2013.

Child fatalities and injuries associated with strollers are caused by a wide variety of issues. Staff and ASTM stakeholders have addressed the most severe and/or common of these issues (listed below) with recent changes to the voluntary standard:

1. Wheels
2. Parking brakes
3. Lock mechanism (one fatality)
4. Restraints
5. Hinges
6. Structural integrity
7. Stability/tip over
8. Clearance (two fatalities due to head entrapment)
9. Cord/strap length
10. Canopies

Over the last 2 years, the ASTM subcommittee F15.17 on strollers has improved an existing or developed a new performance requirement for each of these issues. ASTM stakeholders include representatives from the stroller manufacturing industry, durable children's products consultants, retailers, consumer advocacy groups, importers, third party test laboratories, and CPSC staff. All of the new or improved requirements, with the exception of one, are included in ASTM F833-13. A requirement that addresses the scissoring, shearing, and pinching hazards associated with two-dimensional (2D) fold strollers is still in a draft stage and has not yet been incorporated into the ASTM standard. Staff believes that ASTM F833-13, combined with the requirement associated with 2D fold strollers, will address all the major hazard scenarios resulting in a substantially more robust stroller and carriage safety standard.

A. Product Description

A stroller is a wheeled conveyance for one or more children in a seated, standing, or reclined position intended to be propelled by a caregiver at a walking or jogging pace. The caregiver typically pushes the stroller, which usually has one or two swiveling front wheels to facilitate turning. Strollers are normally used for children from infancy to 36 months of age. Strollers are generally constructed from a metal tubular frame with metal or plastic hinges and a fabric seat. All strollers known to staff, with the exception of strollers that can accommodate 4, 6, or more children, and that are used primarily in commercial environments, fold for storage and transport. Some of the safety devices that are required by ASTM F833-13 include a harness system, a parking brake, and a latch to prevent unintentional folding. Common design features include (but are not required by the standard): trays for the occupant and cup holder trays for the caregiver (shown in Figure 1); storage areas under or behind the seat; and foot rests.

Strollers are commonly classified by the manner in which they fold. Strollers in which two dimensions, the height and length, are reduced when folded are called "2D" strollers (Figure 1). Strollers that collapse in all three dimensions—height, length, and width (Figure 2)—resulting in a smaller folded package than 2D strollers are called "3D" strollers.



Figure 1. Stroller that folds in two dimensions (2D stroller).



(a) “Umbrella” 3D stroller.

(b) Large 3D stroller.

Figure 2. Stroller that folds in three dimensions (3D stroller)

There are four other categories of strollers becoming increasingly popular with consumers:

- Universal
- Travel systems
- Hybrid products
- Jogging strollers

The first three groups are products that combine a handheld carrier/car seat with a stroller frame. Universal stroller frames do not come with an integrated seating area for a child. Instead, the child is placed in a detachable car seat that is sold separately. The caregiver will remove the seat from their vehicle and secure it to the universal stroller frame (Figure 3). Universal stroller frames may be either 2D or 3D strollers. Travel system strollers typically consist of a wheeled frame similar to a universal stroller, a traditional stroller seat, a handheld carrier/car seat, and a car seat vehicle attachment. The travel system wheeled frame is only intended to be used with the handheld carrier/car seat provided with the travel system. Hybrid stroller products are customizable or modular travel systems consisting of multiple components, such as a stroller

frame, a removable stroller seat, a detachable carriage basket, and a detachable handheld carrier/car seat. Usually these frames can be used with both the frame manufacturer's detachable hand held carriers/car seats and those made by other manufacturers. Jogging strollers typically have only three wheels, two at the back and one at the front (Figures 4 and 5). The front wheel is either permanently fixed (non-swiveling, see Figure 4) or swivels, but the front wheel can be locked in place when jogging (Figure 5). Jogging strollers often use bicycle-style wheel attachment systems.



Figure 3. Universal stroller (2D) without the car seat attached, with a rearward-facing handheld carrier/car seat attached, and with the frame folded.



Figure 4. 3-wheeled jogging stroller with fixed (non-swiveling) front wheel.



Figure 5. 3-wheeled stroller with swiveling lockable front wheel.

Carriages (Figure 6) are also wheeled conveyances propelled by a caregiver, but the intended occupant is a newborn or infant who cannot sit unassisted, and therefore, is placed in a supine position. Carriages nearly always have four, fixed (non-swiveling) wheels and may also fold for storage and transport. Some hybrid strollers have a carriage basket that can be attached to the stroller frame for use in carriage mode. The ASTM standard for strollers also applies to carriages, but there have been a very small number of incidents with no reported injuries. Staff has identified no carriage-specific hazards.



Figure 6. Baby carriages.

B. Incident Hazard Review

Over the past 5 years, January 2008 through December 2012, inclusive, 1,207 incidents related to strollers were reported to CPSC staff involving children less than 5 years of age.¹⁴ Of these, there were four fatalities, 359 nonfatal injuries (10 hospitalizations), and 844 noninjury incidents. Three of the four deaths were attributable to the products' designs. Two fatalities were caused by insufficient clearances between structural members of the stroller frame, which led to head entrapments.

The first entrapment death occurred when a child's head was trapped, and he strangled after sliding down through the space between the seat and the tray. The second entrapment death occurred when a child's neck was trapped between a metal bar located under the cup holder of a travel system stroller frame and the front edge of a handheld carrier/car seat positioned to face the caregiver. The third design-related death was attributed to a latching/locking mechanism failure. An unlatched, partially erected 2D stroller collapsed when a 4-year-old child climbed into the seat. The fourth fatality was a drowning when a stroller rolled off of a dock with a child secured in the seat. The drowning incident report did not have enough information to determine if the stroller's parking brakes or other design elements contributed to the incident.

Ten of the 359 reported nonfatal injuries required hospitalization. Hospitalization, in this instance, means that the victim was admitted to the hospital. Visits to the ER and other outpatient treatments are not included. Details on the hospitalizations are listed below:

- One skull fracture (stroller collapse)
- One concussion (wheel detachment)
- Four finger amputations:
 - Two from stroller collapse
 - One from canopy hinge
 - One from reversible handle bar

¹⁴ Memorandum from Angie Qin to Rana Balci-Sinha, "Stroller-Related Deaths, Injuries, and Potential Injuries; January 2008–December 2012," April 2, 2013.

- One collarbone fracture (wheel detachment)
- One instance of periodontal damage (seat detached and fell from travel system)
- One near-drowning (stroller fell into lake)
- One head injury (child fell from stroller)

More than 99 percent of the incidents (1,202 of 1,207) reported stroller design-related incidents. The remaining five were reports of consumer concerns and/or complaints regarding products or questions regarding CPSC recall notices. The hazards identified in the incident reports are summarized in Table 1 and presented in order of frequency.

Table 1. Incident hazard patterns.

	Hazard Pattern	Product-related Incidents	Total Injuries	Hospitalizations	Fatalities
1	Wheel	429	52	2	
2	Parking Brake	132	8		
3	Lock Mechanism	121	42	2	1
4	Restraint	83	29		
5	Hinges and Folding	75	72	1	
6	Structural Integrity	63	16	1	
7	Stability/Tip over	58	24		
8	Clearance	38	19		2
9	Car Seat Attachment	35	5		
10	Miscellaneous	40	15		
11	Unspecified*	32	21	2	1
12	Canopy	24	18	1	
13	Handlebar	21	7	1	
14	Sharp Points, Edges, Protrusions	18	16		
15	Seat	19	4		
16	Tray	14	11		
17	Consumer Complaint	5	0		

*Causes of unspecified hazards cannot be determined due to lack information about the incident.

A more detailed description of each hazard pattern and how it has been addressed are presented below (**bold font** indicates a hazard pattern where fatalities have been reported).

1. Wheel Issues

Failure modes—A total of 429 incidents associated with wheels were reported to CPSC. There are four main failure modes associated with wheels observed in the incident data. First, a stroller wheel, which is usually a molded plastic unit with a rubber tread, can break and come off of or no longer rotate about its axle. When this occurs, the stroller can suddenly lean to one side, or fall, or flip over.

Second, an otherwise intact wheel may become detached from the stroller. This is more likely to occur with the front wheels, due to the greater frequency of obstacle impacts during normal use. The resulting injury scenario is identical to the first failure mode above.

The third failure mode is an unstable wheel, also known as wheel shudder (rapid left-right direction oscillations while rolling, commonly seen on shopping carts). If the magnitude of the wheel direction oscillations is large, the wheel can turn perpendicular to the direction of travel and stop rolling. As with the earlier failure modes discussed, this can cause the stroller to fall to one side.

Finally, there are reports in which a pneumatic tire or inner tube bursts. This can also cause the stroller to fall to one side.

How addressed—The first two failure modes, wheels breaking off of an axle and wheel detachments, are addressed with a new wheel attachment performance requirement approved for ASTM F833-13. This is the first requirement that tests how strongly wheels are attached to the stroller. There are two components to this performance requirement: (a) wheel detachment from an axle; and (b) swivel wheel assembly detachment from the stroller frame. The performance requirement, section 6.9 of ASTM F833-13, states that wheels and swivel assemblies must not detach from the stroller when tested; and section 8.2.2.4 of F833-13 requires that a warning label be placed on the fork, alerting the consumer to the possible tip-over hazard if a wheel detaches. In addition, new warning labels are required for three-wheeled strollers if the front wheel is intended to be locked during running, jogging, or walking fast to help prevent tip-over incidents caused by wheel shudder. A full discussion of this new performance requirement is given in section 1 of Appendix A. The third and fourth failure modes, wheel shudder and pneumatic tire failures, do not have any new performance requirements at this time. Both are the result of events and conditions largely outside of the manufacturer's control. Also, staff found no evidence of pervasive use of poor materials or inadequate tire construction; therefore, staff does not recommend any further action at this time.

2. Parking Brakes

Failure mode—There were 132 incidents related to parking brake failure or parking brake assembly problems, including eight injuries (abrasions, contusions, and lacerations). The injuries typically occurred when the caregiver set the parking brakes, presuming they were functional, but instead, the stroller rolled away and struck an object (e.g., wall or parked car), tipped over, or both.

The typical stroller parking brake system consists of plastic castellations molded into the inside face of a rear wheel, in between which a plastic tab is locked to prevent the wheel from rotating (Figure 7). The tab is molded to a plastic lever that the consumer presses down to engage the parking brake, and lifts up to disengage. Parking brakes on strollers are meant to be engaged after coming to a complete stop and must be fully released before moving again. One failure mode occurs when the thickness of the castellations

and/or tab is not matched to the strength of the plastic. This results in a parking brake system that may not be strong enough to prevent the wheels from moving while on an incline. The most common failure mode reported in the incident data was parking brakes that had worn out. If parking brakes are not completely disengaged when the stroller is in motion, the plastic castellations can wear down rapidly or break.

How addressed—A more stringent parking brake system performance requirement that addresses weak parking brakes has recently been approved for ASTM F833-13 and is described in more detail in section 2 of Appendix A. The test is repeated five times with a force increased approximately 50 percent. Staff believes that the improved requirements are adequate; therefore, staff recommends no further action with regard to parking brake systems at this time.

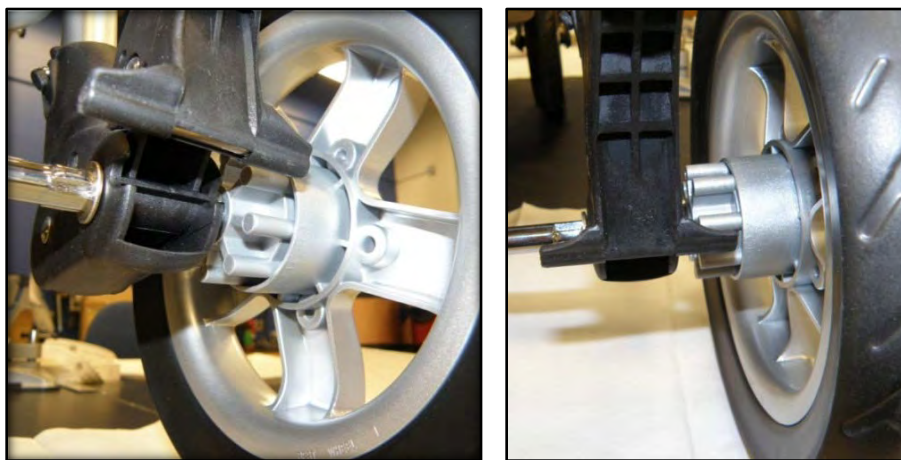


Figure 7. Typical parking brake construction.

3. **Lock Mechanisms for Frame Folding (1 Fatality)**

Failure mode—This hazard pattern contains 121 incident reports with 42 injuries, including one fatality and two hospitalizations for a skull fracture and an amputated finger. The fatal incident occurred when a partially erected, unlatched stroller collapsed when a child climbed into the seat. In other reports, the initial placement of the child in the stroller was successful, but an impact with a surface irregularity while the stroller was moving triggered the release of the latch/lock system.

How addressed—CPSC staff and ASTM developed a more stringent performance requirement described in section 3 of Appendix A. It requires successful completion of a test that applies a force to the handle bars in a direction likely to break and disengage the folding latch system. In lieu of a high-cycle durability test that incorporates loads expected during normal use, the recommended test uses a larger-than-normal force applied five times. Staff believes that this approach will yield a substantially similar level of stroller latch structural integrity while reducing the test time. This requirement has been approved by ASTM and is included in ASTM F833-13.

4. Restraints

Failure mode—This category includes 83 reports of restraint failure, breakage, or detachment. It also covers cases where the restraint was unbuckled by the child, too loose or too long, and not used at all. Twenty-nine injuries have been attributed to this hazard pattern, mostly abrasions and contusions.

How addressed—Staff believes that the preexisting performance requirement (6.4) sufficiently addresses the restraint system breakage, detachment, and fit failure modes; therefore, staff does not recommend any changes to the associated performance requirements. However, the ability of a child to escape by unbuckling the harness straps was not addressed prior to ASTM F833-13. A new performance requirement has been added for this purpose, which requires that restraint system buckles and fasteners either release by double action or require a force greater than the level that a child's fingers can generate to release a single-action buckle. A complete discussion of this requirement appears in section 4 of Appendix A.

5. Hinges and Folding Issues

Failure mode—Nearly every incident in this hazard category involved an injury (72 out of 75, or 96 percent). This is the highest injury rate of any stroller hazard category and includes one hospitalization for an amputated finger. These types of injuries generally occur when a body part is inadvertently placed between two rigid objects that move relative to one another with little or no separation. All strollers known to staff have multiple hinged joints that could potentially cause a scissoring, shearing, or pinching injury when various components (*e.g.*, metal frame segments, bracing, hinge and latch components, and brackets) move relative to one another. Once erected, however, these components are not intended to move. The incident reports state that these injuries nearly always occur before the stroller is fully erected and locked into the manufacturer's recommended use position. The injury scenarios include:

- Child climbs into a stroller when it is mostly, but not fully erected and locked into place, and places hands on a hinge, and pinches their finger when the hinge is snapped closed.
- Child grasps a component while the caregiver erects a stroller.
- Child is in the stroller and the stroller starts to collapse unexpectedly, and the child's hand gets caught when the caregiver attempts to relock it.

How addressed—Certain pinching and shearing hazards are addressed in ASTM F833-13, as well as in previous versions of the standard. Section 5.7 states that parts rotating about a common axis or fastening point, slide, pivot, fold, or otherwise moving relative to one another must be designed to prevent injury. However, this requirement applies only after the stroller has been erected and secured in the manufacturer's recommended use position.

A more robust pinching, shearing, and scissoring performance requirement was developed based on the incident data which show that the majority of the injuries

associated with this hazard occurred when the stroller was partially erected or while being unfolded. The folding motions of the two main stroller folding classes, 2D and 3D, are distinct, and therefore, they are addressed separately. ASTM F833-13 now includes the 3D folding performance requirement (see section 5 of Appendix A).

However, the voluntary standard does not yet include the 2D folding performance requirement currently being balloted. Accordingly, staff recommends proposing a rule that would adopt ASTM F833-13 with one modification, adding the most recently balloted 2D fold requirement language (ASTM F15 (13-01) Item Number: 006) to address pinching, shearing, and scissoring hazards while the stroller is being unfolded and latched.

6. Structural Integrity

Failure mode—The 63 incident reports in this hazard pattern category contain a broad range of product failures. Points of failure included: structural elements of the frame; numerous attachment points for the seat, footrest, sunshades, and umbrellas; and welds and hardware that secure hinged joints, accessories, and wheels. A stroller's stability, ability to roll, and operability are impaired when these elements fail. In 16 reports, these failures led to injuries in a variety of ways, including occupant impacts due to strollers tipping over, joints pinching fingers, and sharp edges scratching occupants. These injuries occurred when individual components of the product were no longer secured as intended, causing the stroller to react in ways unpredictable to the consumer.

How addressed—ASTM F833 does not have a specific requirement for structural integrity. However, a stroller must remain operational and not break after the performance requirement tests are performed. ASTM F833-13 performance requirements that contribute to this general evaluation of structural integrity are:

- 5.5 *Latching Mechanisms* with the recent changes made to ASTM F833-13, as described in section 3 of Appendix A;
- 6.1 *Parking Brake Requirements* with the recent changes made to ASTM F833-13, as described in section 2 of Appendix A;
- 6.2 *Static Load*;
- 6.3 *Stability* with the recent changes made to ASTM F833-13, as described in section 6 of Appendix A;
- 6.4 *Restraining System*; and
- 6.7 *Impact Test*

Staff believes that the current requirements associated with structural integrity are sufficient, and therefore, staff does not recommend any further changes at this time.

7. Stability and Tip-Over Issues

Failure mode—There are 58 reported incidents in this hazard category and 24 injuries, all minor abrasions and contusions. No general or pervasive failure modes can be discerned

from the incident reports that included a description of the tip-over events. The failure modes were widely varied and included:

- Diaper bag hanging on the handles destabilizes the stroller, tipping it over backwards (manufacturer recommends against this);
- Seated children suddenly lean outside of the seat to reach for something;
- Consumers pull a stroller backwards up stairs and it falls sideways;
- Strollers fall over when children climb in from the front or sides; and
- Rough and uneven surfaces upset the stroller's stability, causing it to fall sideways.

How addressed—ASTM F833-13 performance requirement 6.3 *Stability* states that the products shall not tip over during two sets of tests included in section 7.4. The first series of tests place a 17.4 lbm Mark II CAMI Dummy into the product then put the loaded product on a surface inclined 12.°. The product is evaluated: pointing down- and up-slope, and cross-slope; with the seat back upright and reclined (if product has a reclining seat); and with swiveling seats rotated into all recommended use positions. The other series of tests evaluate the stability of a stroller by simulating a child climbing in from the front. Rotating seats are specifically addressed in ASTM F833-13. Likewise, new language clarifying the load application portion of the climbing-in test procedure has also been included in F833-13. The language that was recently added to the standard is discussed in section 6 of Appendix A. Staff does not recommend any further action at this time.

8. **Clearances (2 Fatalities)**

Failure mode—There were 38 incidents (19 injuries) related to clearance issues, including two of the four fatalities. This category is similar to, but more encompassing than, the hinge issues described above. In that category, only the clearances between components relating to hinged motion were considered, primarily dealing with fingers or small body part entrapment. This section's hazard pattern excluded the hinge-related clearances already discussed and encompassed all other clearance issues, some that could result in fatal entrapments involving the occupant's head and/or torso. These clearance areas included: areas between the seat and the handlebar, basket, canopy, side, tray, or frame; between the footrest and the basket or wheel; between the car seat of a combination car seat/frame system and the handlebar; and between wheels.

Both fatalities were strangulations caused when a child's head became entrapped. In the first incident, the victim's head was entrapped between the stroller seat and tray. At the time of the incident, the stroller model had been recalled for this hazard, but the repair kit was not installed. The caregivers were not the original purchasers of the stroller. In the second incident, the 5-month-old victim was found dangling with his head wedged between the handheld carrier/car seat attachment and the stroller handle. He had been put in the car seat while it was attached to the stroller and left unsecured while he slept. His parents had been using the product regularly in this manner for naps.

There are 15 additional reported incidents resulting in head entrapment, most often between the front tray and the seat. Caregivers usually spotted this dangerous situation immediately; nonetheless, seven injuries occurred, including a partial asphyxiation. The other 12 injuries attributed to this hazard pattern occurred when unsecured children slid out of the stroller onto the ground, or they placed an arm, finger, or foot between two components and became stuck. These injuries were minor and involved abrasions, contusions, and lacerations.

How addressed—The most severe clearance hazard patterns were those that led to the strangulation deaths. ASTM F833-13 section 6.8, *Passive Containment/Foot Opening*, requires all strollers to meet an anti-entrapment requirement in the front of the stroller where the tray or grab bar is located. The associated test checks whether the space between a front tray and the seat can admit a small child's torso (simulated with a test probe). If it can, then it must also admit a larger child's head (simulated with an 8" diameter sphere). This performance requirement adequately addresses the hazard pattern that led to the first fatality described above. In fact, this requirement has already led to larger spaces between trays and seats, which, as reported in seven of the incident reports (two injuries), permitted an unsecured child to slide completely out of the stroller rather than become trapped.

The second death was due to a gap in a travel system that occurred between the foot-end of a handheld carrier/car seat and a cup holder tray on the stroller's handle. In that case, the child was found suspended. A new performance requirement developed by staff and ASTM stakeholders was recently approved and added to ASTM F833-13; it addresses entrapment between the foot-end of a rear-facing, handheld carrier/car seat and the stroller handle. The requirement is functionally identical to the anti-entrapment requirement described above: if a small child's torso can fit through the bounded opening created by the foot-end of a hand-held carrier/car seat and the stroller handle, a large child's head must also pass through. This requirement is discussed in more detail in section 7 of Appendix A, and staff believes it will adequately address this type of head entrapment hazard; accordingly, staff recommends no further changes.

Out of the 12 incidents in which a foot, arm, or finger became stuck between two components, four incidents resulted in minor injuries. The hand entrapment scenarios described in the incident reports involved children grabbing a wheel while the stroller is in motion. There was insufficient information to determine the failure mode of the incident in which a child's arm was entrapped between a double stroller's seats. There are 4 foot-entrapment incidents, all of which involved a seated child getting their foot between the foot rest and the swiveling front wheels. At this point, there is insufficient evidence that this hazard is pervasive or severe enough to justify or guide action. Staff will continue to monitor incoming incident reports for stroller foot entrapments but recommends no changes at this time.

9. Handheld Carrier/Car Seat Attachments

Failure mode—The 35 handheld carrier/car seat attachment-related incident reports mention attachment system breakage, attachment systems that do not hold the handheld carrier/car seat securely, handheld carrier/car seat adapters for strollers that detach unexpectedly, and general concerns about the stability and robustness of attachments. Five fall injuries were reported.

How addressed—Products that are a combination of a stroller frame and handheld carrier/car seat are called “combination units” by ASTM F833-13 when in this configuration. These products are used for younger children who weigh about 30 lbs. or less. When used according to the manufacturer’s instructions, the child is secured in the handheld carrier/car seat while the combination unit is in use. The limited reach of a secured child in this stroller configuration, and the fact that they will not be climbing into the handheld carrier/car seat by themselves, reduces the hazards faced by users relative to other stroller configurations. Therefore, ASTM F833-13 does not require that this stroller’s combination unit configurations meet all the requirements in the standard. But, it does require that strollers in this configuration meet the latching general requirement (section 5.5), and performance requirements for parking brakes (section 6.1), static load (section 6.2), and stability and tip over (section 6.3). This last performance test requires that the handheld carrier/car seat not detach completely from the stroller frame or have any broken parts when subjected to the tip-over test in section 7.10. The tip-over test is performed by pushing the unit gradually past its center of balance until it falls over. This is done three times: toward the front, rear, and to one side.

Both the number and severity of injuries due to this hazard pattern are low. No Commission action is recommended at this time; but staff will continue to monitor incoming incident reports and work with ASTM to develop these tests further.

10. Canopy Incidents

Failure mode—The 24 reported incidents show that stroller canopies can present several hazards to children. The shape of a canopy’s textile shell is maintained by plastic or metal strips/rods called spreaders. The ends of these are attached to the right and left handle tube of the stroller frame. When fanned out, the canopy provides a sun and rain shield for the occupant. (See Figures 1, 2b, 3, 4, and 5 for images of strollers with canopies.) However, the spreaders move relative and adjacent to one another when the canopy is closed. This creates a scissoring/shearing/pinching hazard (18 incidents, 16 injuries, including four amputations).

Additionally, cords attached to canopies to pull them open or closed can enter the occupant space and present a strangulation hazard (two incidents, no injuries). Other reported incidents mention sharp edges and potential choking hazards with loose material. There were two reports of children removing the plastic lining of a canopy while in the stroller, a potential choking hazard. In both cases, the caregiver was present and took immediate action to avoid injury.

In all, 75 percent (18 of 24) of the incidents involving a canopy resulted in an injury, including one hospitalization for an amputated finger.

How addressed—Staff has developed performance requirements with ASTM stakeholders to address the scissoring, shearing, and pinching, and cord and strap strangulation hazards discussed above. The approved changes in ASTM F833-13 that address scissoring/shearing/pinching hazards are presented in section 5 of Appendix A; new requirements for cords and straps are discussed in section 8 of Appendix A. Staff believes the choking hazards are adequately addressed by ASTM F833-13 in section 5.2 (small parts prohibition). No further actions regarding the choking hazard pattern are recommended at this time.

11. Handlebar Problems

Failure mode—There were 21 reported incidents related to handlebars. A failed handlebar hinge or latch system was responsible for half of these (18 incidents), and more than half (5 of 7) of the injuries. One hospitalization occurred where a child's finger was amputated when it was caught in a stroller's reversible handlebar. There were 13 incidents reporting cracked metal frames, handle grips breaking or loosening, and loose hardware. The remaining reports did not include enough information to identify the root cause of the incident.

How addressed—The structural integrity of handlebar hinges and latches, the strength of the metal frame, and handle grip structural integrity are addressed with the improved performance requirement for latches in ASTM F833-13. This recommendation is discussed in section 3 of Appendix A of this memorandum. Staff does not recommend any action to address the incidents for which insufficient information is available.

12. Seat Issues

Failure mode—The four injuries mentioned in the 19 seat-related incident reports were all minor contusions or abrasions. Nine of the incidents reported a fabric seam in the seat back that separated, allowing the occupant to fall backwards; eight of these were related to a specific model from one manufacturer. There were five incidents related to textile seat attachment failures. The remaining five incidents did not include enough information to determine a failure mode.

How addressed—Seam failures are addressed by ASTM F833-13 with the section 6.2 *Static Load* performance requirement. This requirement states that each stroller seat shall support 100 lbm or 2.5 times the manufacturer's recommended weight. Staff believes this requirement adequately addresses the hazard, and therefore, does not recommend further action.

13. Sharp Points and Edges, and Protrusions

Failure mode—There were 18 incident reports involving hazards from sharp points and edges. Sixteen injuries were reported, including one incident where three layers of a child's cornea required repair. The child's eye was damaged when she stood up and fell against a rounded hook on the inside face of a double stroller's frame rail. The hook was one of four identical hooks (two on each side) used to suspend an expandable storage area. Although the hook was not sharp, the way the child fell against it allowed it to damage the cornea. The hook is slightly rounded and considered a hazardous protrusion, not a sharp point or edge. There were 10 incidents in which a plastic burr or flashing was not removed from the product during the manufacturing process and was accessible by an occupant. Three of these incidents involved a minor injury (small scrape or cut). Four incidents involved a canopy or umbrella attachment point that broke or became unexpectedly separated, and exposed rough or sharp edges that scratched the occupants. The remaining incident reports lacked sufficient information to determine the failure mode.

How addressed—Sharp edges and points are addressed with ASTM F833-13 general requirement 5.1, which states: "there shall be no hazardous points or edges" on the product when first assembled and after all of the other tests in the standard are performed. A determination is made by testing suspect parts of the product per 16 C.F.R. § 1500.48 and 16 C.F.R. § 1500.49. Staff believes this is sufficient, and therefore, staff does not recommend any further action to address sharp points and edges at this time. Protrusion hazards are not specifically addressed by the voluntary standard, but staff is aware of only one incident related to protrusions. Staff does not recommend further action at this time, other than monitoring incoming data.

14. Tray Issues

Failure mode—There were 14 incidents that reported tray issues. Eleven described injuries, eight of which were to occupant's fingers, including one amputation. The ninth incident was an unspecified leg injury that occurred while a child was sitting on a tray. The remaining two injuries were to the teeth that occurred while a child was teething on a tray. All of the finger injuries occurred in one of two ways. First, in five of the eight finger injuries, an articulated tray was being closed and latched, and the tray pinched or sheared the occupant's finger. Second, the remaining three finger injury incident reports described a finger or hand becoming entrapped by a hole in the tray or between the tray and another part of the stroller's structure.

How addressed—Most of the reported tray-related incidents involved pinch hazards with the closing motion or gaps that entrap small fingers. These hazards are similar to the hinge and clearance hazard patterns discussed above (see sections I.B.5. and I.B.8.). ASTM F833-13 does not specifically address scissoring, shearing, and pinching hazards due to tray articulation, latching, or locking. However, it does include a general requirement for openings that prohibits holes that can entrap a child's finger once placed in the manufacturer's recommended use position (*i.e.*, with the tray secured in place).

Staff believes the work done with ASTM stakeholders (specifically manufacturers, third party test laboratories, and design/engineering consultants) has heightened awareness of stroller scissoring, shearing, and pinching hazards. This hazard pattern has a high injury rate (11 of 14, or 79 percent) and includes one incident with severe injury. Staff will continue to monitor the data, but no further action is recommended at this time.

15. Consumer Complaints

Failure mode—None of the five consumer complaint incident reports mentions product failures. All expressed concern that their stroller might pose a fall or a scissoring, shearing, or pinching hazard.

How addressed—No stroller performance requirements have been identified that would specifically address general consumer complaints. Several recommendations have been made by staff to address scissoring, shearing, and pinching hazard patterns (see section 5 of Appendix A and Appendix B). No further action is recommended at this time.

16. Miscellaneous (Includes Choking)

Failure modes—This hazard pattern contained 40 incidents, 15 of which involved injuries. The most common failure mode (15 incidents, 6 injuries) was a child choking on a toy accessory or tag that had been removed from the product. The next most injurious failure mode was the unexpected detachment of a jump seat or a booster toddler seat accessory while in use (see Figure 8). There were five reports of a child suffering abrasions and contusions when the jump seat or booster toddler seat detached while they were in it. This hazard pattern category also included reports of incomplete assembly and comments regarding recall notices.



Figure 8. Jump seat and booster toddler seat accessories.

How addressed—The choking hazards identified above are addressed by ASTM F833 in the small parts prohibition of section 5.2, section 5.9 *Labeling*, which requires labels and tags to be permanently attached and not liberate small parts, and section 5.12 *Toy*, which

requires toy accessories to meet the requirements of the toy safety standard, ASTM F963-11.¹⁵ Because the jump seat and toddler seat hazard patterns were related to two manufacturers and have already been addressed by voluntary recalls,^{16,17} staff does not consider this to be a pervasive problem for strollers. No further action is recommended at this time, but staff will continue to monitor incoming incident reports. Staff also does not recommend any changes to ASTM F833-13 to address incomplete assembly reports and recall notice comments.

17. **Unspecified (1 Fatality)**

Failure mode—This hazard pattern category contains 32 incident reports where no clear determination can be made regarding specific failure modes. It includes three incidents in which a stroller with a child strapped into the seat fell into a body of water. One of these incidents led to death by drowning. In similar, nonfatal incidents, caregivers witnessed the stroller fall into the water and reacted quickly to rescue the child. The caregiver in the fatal incident was fishing off a dock with other children playing nearby and did not hear the stroller fall into the water. Investigators at the scene noted that the parking brake wheel castellations and brake lever tabs were damaged but could not state if the damage was recent or not, or if their damage led directly to the stroller falling off the dock. There are nine reports, including pinched (5), crushed, and (2) amputated fingers (2). The location on the stroller where the finger injuries occurred is not known. Other reports appear to describe handheld carrier/car seat attachment issues, restraint system failures, or very general statements that a product was defective, with no other details mentioned.

How addressed—Without details regarding the specific nature of the failure modes, staff cannot recommend any actions to address these incidents. Staff believes that the new changes to the parking brake (section 2 of Appendix A) and scissoring, pinching, and shearing (section 5 of Appendix A and Appendix B) performance requirements will address some of these incidents.

18. **Older Children and Adult Caregiver Incidents**

Failure mode—Approximately 64 percent of the incident documents in this category (50 of 78) reported an injury to the finger, hand, toe, or leg of an adult caregiver, or, in one instance, a 5- to 10-year-old child. Most of the remaining incidents (23 percent; 18 of 78) were related to wheel problems.

How addressed—Staff has focused this rulemaking effort on preventing the unreasonable risk of death and injury to children under 5 years of age caused by their use of and

¹⁵ ASTM Standard F963-11, “Standard Consumer Safety Specification for Toy Safety,” ASTM International, West Conshohocken, PA. www.astm.org.

¹⁶ Joint News Release from CPSC and Health Canada, “Baby Jogger LLC Recalls Baby Jogger Jump Seats Due to Fall Hazard,” [Release #11-145](#), 3/1/11.

¹⁷ News Release from CPSC, “ValcoBaby Booster Seats Recalled Due to Fall Hazard,” [Release #13-012](#), 10/23/12.

interaction with strollers. Staff believes that this population is the most vulnerable and susceptible to stroller hazards. However, injuries suffered by older children and adults fall into hazard patterns similar to those with young children, primarily wheel detachment and the numerous ways a stroller can pinch, amputate, or lacerate a finger, hand, toe, or leg. Staff believes the requirements in ASTM F833-13 (see section 5 of Appendix A), when combined with the staff-recommended addition associated with 2D fold strollers (see Appendix B), will address almost half of the adult injury hazard patterns. Staff will continue to monitor incoming data for incidents involving adult caregivers and older children, but we recommend no further action at this time.

C. Review of Mandatory and Consensus U.S. Standards

Currently, the CPSC does not have a specific regulation for strollers. The primary voluntary standard in the United States for strollers is ASTM F833.

ASTM first published a consumer product safety standard for strollers in 1983 (ASTM F833-83). It has been revised 20 times in the past 29 years, with six revisions in the past 5 years. By the end of 2008, the majority of the general requirements were in place:

- Latching mechanisms must resist unintentional folding when a 45-lb. force is applied five times in an attempt to fold the product without releasing a latch;
- Toy accessories must meet the requirements of ASTM F963, *Standard Consumer Safety Specification for Toy Safety*; and
- Several general requirements common to ASTM standards, including: hazardous points and edges; small parts; paint and surface coatings; wood being smooth and free of splinters; holes and slots that could trap a child's finger; exposed coil springs; warning label permanency; and retention of protective components.

The eight performance requirements contained in ASTM F833-08 were¹⁸:

- 6.1) *Parking Brake* – A parking brake must be provided and the braked wheels shall not rotate more than 90° when tested on a 12° incline.
- 6.2) *Static Load* – A stroller shall support a weight of 100 lbs. or 2.5 times the manufacturer-recommended maximum weight in each individual seating area. A combination unit with a car seat on a stroller configuration must support a 50-lb. weight.
- 6.3) *Stability* – The product with a 17-lb. CAMI infant dummy shall not tip over when placed on a 12° incline and shall not tip forward when a 40-lb. force is applied downward, where a child would likely step to climb into the stroller.
- 6.4) *Restraining System* – A three-point restraint system (waist and crotch) must be present and may not detach, nor may the adjusting elements permit slippage of more than 1 in. when tested as follows:

¹⁸ These are brief summaries of the requirements and associated tests, as of 2008. Please see ASTM F833-08 for complete details.

- a. Apply a 45-lb. force to each anchoring point; and then
 - b. Insert a CAMI infant dummy, secure the restraints, and pull on a leg with 45 lbs. of force five times.
- 6.5) *Occupant Retention* – A wall surrounding all sides above the floor of the occupant space shall not permit the passage of a 3-in. diameter probe.
- 6.6) *Combination Unit of a Car Seat on a Stroller* – This section lists the specific requirements strollers with combination frame/car seat product configurations must meet to eliminate omissions due to differing interpretations of the standard.
- 6.7) *Impact Test* – The product shall not become damaged, and the car seat may not become completely separated from the frame, with 40 lb. (or the maximum recommended weight) secured by the restraint system in each seating area, then allowed to roll 40 in. down a 20° slope into a rigid steel stop.
- 6.8) *Passive Containment/Foot Opening* – Products with a tray or grab bar in front of the occupant that create an opening that could potentially trap a child's head are not permitted. If the opening permits the passage of a 3.0 in. x 5.5 in. torso probe, it must also permit the passage of an 8.0 in. diameter head probe sphere.

Modest changes were made to the standard from 2008 through 2011. In addition to editorial alterations and clarifications, the 2009 revision (ASTM F833-09) excluded self-propelled products, including tricycles with push handles. The next revision, published in May 2010 (ASTM F833-10), added rotating seats to the stability test, and more importantly, made the impact test more stringent. As of ASTM F833-10, the detachment of *any* handheld carrier/car seat attachment point from a stroller frame would constitute a failure of the impact test. The 2011 version of the standard added a requirement specifying the text size for instructional literature warnings.

II. RECENT CHANGES TO ASTM F833

All of the recent changes to ASTM F833 were recommended by staff and developed over the past 19 months with ASTM F15.17 subcommittee stakeholders. Task groups were formed to develop language addressing the most challenging new performance requirements. CPSC staff worked with the ASTM stakeholders in the task groups to develop, validate, refine, and clarify the language for the new requirements. ASTM has issued four Section F15¹⁹ ballots since December 2011,²⁰ with a total of 25 stroller-related items on these ballots. These various ballot items address the 11 most severe or frequent hazard patterns identified by CPSC staff. All are being addressed with 10 new or improved requirements included in the recently approved

¹⁹ ASTM Section F15 is the ASTM committee responsible for all consumer product safety standards.

²⁰ Ballot (11-09) was open from December 12, 2011 to January 13, 2012, and included 11 items for F833. Ballot (12-04) was open from May 10, 2012 to June 12, 2012, and included five items for F833. Ballot (12-07) was open from September 14, 2012 to October 14, 2012, and included six items for F833. Finally, Ballot (13-01) was open from January 27, 2013 to February 27, 2013, and included three items for F83.

version of the standard, ASTM F833-13. A summary of these changes is presented in Table 2. Details of each requirement are included in Appendix A.

Table 2. Summary of Recent Additions to ASTM F833-13.

	Category	Hazard Addressed
1	Parking Brake	Rolling away unsupervised
2	Head entrapment	Asphyxiation and strangulation
3	Wheel Detachment	Falls (abrasions, contusions, head injuries)
4	Lock/Latch Integrity	Finger pinch, asphyxiation
5	Restraining System and Buckle Release	Escape, falls
6	3D Hinge Accessibility	Finger pinch and amputation
7	Canopy Hinges	Finger pinch and amputation
8	Stability and tip over	Falls
9	Cords and Straps	Strangulation
10	Warning	(Refinement in the language)

III. COMPARISON OF ASTM F833-13 WITH THE INTERNATIONAL STANDARDS

Staff reviewed mandatory and voluntary standards from Canada, the European Union, and Australia/New Zealand as part of the rulemaking process. A summary of the main standard for each is presented below.

1. Canada

Strollers and carriages are a regulated product class in Canada. They must meet the requirements published by Health Canada in April 1985, SOR/85-379 *Carriages and Strollers Regulations*.²¹ A summary of the requirements that address hazards identified by staff and how they are addressed by the Canadian standard is presented in Table 3. Of particular interest is that their regulation has no requirements addressing head entrapment or buckle release, but restraint system strength requirements are more severe than those in ASTM F833-13.

Table 3. Summary of Selected Requirements in SOR/85-379 (Canada).

#	Category	Hazard Addressed	Requirement	Comments
1	Brakes	Rolling away unsupervised	Wheels of weighted stroller shall not rotate more than 90° when placed on 12° slope.	Substantially identical to F833-13 and AS/NZS 2088:2009.
2	Bounded Openings	Asphyxiation and strangulation	No specific requirement.	

²¹ Canada Consumer Product Safety Act: SOR/85-379 “Carriages and Strollers Regulations,” Registration 1985-04-25.

#	Category	Hazard Addressed	Requirement	Comments
3	Wheel Detachment	Falls (abrasions, contusions, closed head injuries)	Support wheel hub and pull axle with 450 N (102 lbf.), hold for 2 minutes.	Substantially identical to F833-13.
4	Lock/Latch Integrity	Finger pinch, asphyxiation	Evaluate erected product for finger entrapment & pinch sites.	Substantially identical to F833-13.
5	Restraints	Escape, falls	Includes tests similar to F833-13 plus a 450 N (102 lbf.) pull test.	More severe than F833-13.
6	2D Hinge Accessibility	Finger pinch and amputation	Evaluate erected product for finger entrapment & pinch sites.	Substantially identical to F833-13.
7	3D Hinge Accessibility	Finger pinch and amputation	Evaluate erected product for finger entrapment & pinch sites.	No dynamic testing.
8	Canopy Hinges	Finger pinch and amputation	No specific requirement.	
9	Stability and Tip-over	Falls	Product with test mass secured shall not tip-over when on 12° incline.	Substantially identical to F833-13.
10	Cords and Straps	Strangulation	No specific requirement.	
11	Buckle release	Escape, falls	No specific requirement.	

2. European Union

The stroller standard in Europe and the United Kingdom (UK), published in March 2012, is EN 1888:2012 *Child care articles - Wheeled child conveyances – Safety requirements and test methods*.²² A summary of the requirements that address hazards identified by staff and how they relate to the EN standard is presented in Table 4.

Table 4. Summary of Selected Requirements in EN 1888:2012 (European Union and UK).

#	Category	Hazards Addressed	Requirement	Comments
1	Brakes	Rolling away unsupervised	Wheels of weighted stroller shall not move more than 90 mm (3.5 in.) when placed on 9° slope.	Less severe than ASTM F833-13 and SOR/85-379.
2	Bounded Openings	Asphyxiation and strangulation	No head entrapment requirement for strollers.	
3	Wheel Detachment	Falls (abrasions, contusions, closed head injuries)	Support wheel hub and pull axle with 450 N (102 lbf.), hold for 2 minutes.	Substantially identical to F833-13 and Canada's SOR/85-379.
4	Lock/Latch Integrity	Finger pinch, asphyxiation	Locks/latches must remain operational after several dynamic and fatigue tests.	Effective requirement, but tests are time-consuming.

²² European Standard EN 1888:2012 "Child care articles – Wheeled child conveyances – Safety requirements and test methods," approved by CEN on 16 December 2011, © 2012 CEN.

#	Category	Hazards Addressed	Requirement	Comments
5	Restraints	Escape, falls	Child-shaped test mass shall not fall out when secured in product and rotated 360°.	Encourages use of 5-point harnesses.
6	2D Hinge Accessibility	Finger pinch and amputation	No pinch/shear permitted within child-accessible “protected volume” once erected and in use.	Uses “protected volume” to determine area accessible to child while in use.
7	3D Hinge Accessibility	Finger pinch and amputation	No pinch/shear permitted within child-accessible “protected volume” once erected and in use.	Same as (6).
8	Canopy Hinges	Finger pinch and amputation	If hinge is accessible (within protected volume), must not pinch/shear.	No protection if hinge is outside protected volume.
9	Stability and Tip-over	Falls	Product with test mass secured shall not tip-over when on 12° incline.	Substantially identical to F833-13 and SOR/85-379.
10	Cords and Straps	Strangulation	Cords not to exceed free length of 220 mm (8.6 in.), max loop is 360 mm (14.2 in.).	Substantially identical to F833-13.
11	Buckle Release	Escape, falls	No specific requirement.	Buckle strength evaluated, but not release force.

The standard has no requirements addressing head entrapment or buckle release. It employs fatigue tests in several places to evaluate the durability of attachment points and locks/latches. Due to the time-consuming (and therefore costly) nature of fatigue tests, CPSC staff typically favors tests with lower repetitions and higher weights/forces that yield substantially similar results. The Irregular Surface Test, also known as the “rolling road” test, is particularly severe. This test loosely secures a stroller with a test mass restrained in the seat to a device similar to a heavy duty treadmill that one would find in a commercial health club. Affixed to the treadmill’s belt are alternating 1-in. tall rounded bumps and ½-in. tall rectangles. The treadmill is run at 5 kph (2.5 mph), and the product passes over these two sets of bumps 72,000 times.

3. Australia and New Zealand

The standard that covers stroller safety in Australia and New Zealand, AS/NZS 2088:2009 *Prams and strollers—Safety requirements*,²³ was published on December 14, 2009. A summary of selected requirements of interest, similar to those for Canada and the European Union, is presented in Table 5. AS/NZS 2088 is a very thorough and stringent stroller standard. Its weaknesses include the lack of a head entrapment test and a dynamic scissoring, shearing, and pinching test. This standard also employs fatigue tests to evaluate the durability of attachment points and locks/latches, similar to those

²³ AS/NZS 2088:2009 “Australian/New Zealand Standard: Prams and strollers—Safety requirements,” Council of Standards Australia & Council of Standards New Zealand, December 14, 2009.

found in EN 1888; the Dynamic Durability Test in Appendix C of AS/NZS 2088 is a rolling road test substantially identical to the one required in EN 1888, and similarly severe.

Table 5. Summary of Selected Requirements in AS/NZS 2088:2009 (Australia & New Zealand).

#	Category	Hazards Addressed	Requirement	Comments
1	Brakes	Rolling away unsupervised	Wheels of weighted stroller shall not move more than 50 mm (2 in.) when placed on 12° slope.	Substantially identical to F833-13 and SOR/85-379.
2	Bounded Openings	Asphyxiation and strangulation	75 mm (3 in.) probe may not pass through openings	Applies only to strollers that recline > 150°.
3	Wheel Detachment	Falls (abrasions, contusions, closed head injuries)	Support wheel hub and pull axle with 200 N (45 lbf.), hold for 2 minutes.	Less severe than Canada's SOR/85-379 and ASTM F833-13.
4	Lock/Latch Integrity	Finger pinch, asphyxiation	Locks/latches must remain operational after several dynamic and fatigue tests.	Effective requirement similar to EN 1888, tests time-consuming.
5	Restraints	Escape, falls	Waist, crotch and shoulder straps (5-point harness) required plus several other strength and slippage requirements.	Only standard that requires 5-point harness system.
6	2D Hinge Accessibility	Finger pinch and amputation	No pinch/shear permitted at child-accessible points once erected and child secured. Repeat while pushing up/down on stroller handle.	Similar to EN 1888 with addition of pushing on handle.
7	3D Hinge Accessibility	Finger pinch and amputation	No pinch/shear permitted at child-accessible points once erected and child secured. Repeat while pushing up/down on stroller handle.	Similar to EN 1888 with addition of pushing on handle.
8	Canopy Hinges	Finger pinch and amputation	If hinge is accessible (within protected volume), must not pinch/shear.	No protection if hinge is not considered accessible.
9	Stability and Tip-over	Falls	Product loaded with test mass shall not tip-over when on 12° incline.	Substantially identical to all other standards.
10	Cords and Straps	Strangulation	Shall not create loop with perimeter = 360 mm (14.2 in.)	Substantially identical to F833-13.
11	Buckle Release	Escape, falls	Buckle release shall require two separate actions or a 40 N (9 lb.) force.	Similar to ASTM F833-13.

IV. STAFF'S RECOMMENDED CHANGES TO ASTM F833-13

Staff recommends that ASTM F833-13 be adopted as the mandatory safety standard for strollers and carriages, with one modification discussed below:

Add a new performance requirement to ASTM F833-13 to address incidents related to fingers becoming caught, lacerated, or amputated in side pinch points of 2D fold strollers. The hazard pattern is substantially identical to the 3D saddle hinges, but the hinge designs involved are more general. The crushing and shearing hazard posed by the main frame hinges of 2D strollers has led to one recall of 102,000 units since 2008.

The new requirement and test, developed and validated by CPSC staff and the ASTM task group, are functionally equivalent to those developed for saddle hinges and are contained in ASTM Ballot F15 (13-01) Item 6 (see Appendix B). The new requirement states that the frame folding action of a 2D stroller shall not create a scissoring, shearing, or pinching hazard when tested. Just like the saddle hinge test, the new test is dynamic and checks for the hazard with the same two probes while the stroller is moved from a partially to a fully erect and locked position.

However, it was necessary to define the regions of a stroller that do pose a scissoring, shearing, or pinching risk because all hinges on a stroller do not pose an equal hazard to children. Most of the new language developed with the ASTM task group defines the region of a stroller readily accessible, and therefore, most likely to present a hazard to young children. This led to the definition of an "Access Zone" inside which all hinges must be checked. The shape of this area is given in Figure 9. The width of the Access Zone is the width of the stroller. This concept of an area inside which the hazard should be eliminated came from the European stroller standard, EN 1888:2012. Section 4.5.1 defines the concept of a "protected volume," whose shape is similar to the Access Zone in Figure 9. While staff and ASTM have drawn inspiration from our European counterparts, it is worth noting that the recommended new requirement is more stringent than the EN 1888:2012 requirement. EN 1888:2012 does not use a dynamic test to evaluate strollers for shearing and compression hazards.

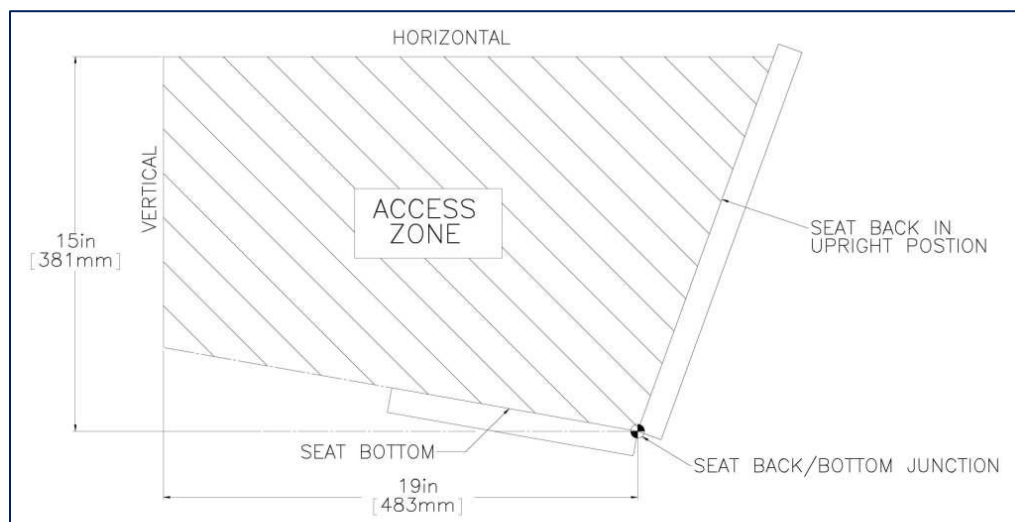


Figure 9. Frame folding stroller scissoring, shearing, and pinching Access Zone.

V. CONCLUSION

Staff recommends that the Commission adopt by reference ASTM F833-13 as the stroller mandatory rule, with one modification described in section IV.

Appendix A: New Requirements to ASTM F833-13

Presented below are details on the requirements most recently added to ASTM F833. Each relates to one or more hazard patterns presented in section I.B. of the briefing memorandum, as noted in the section title. The staff-recommended modification to ASTM F833-13 is not included here, but is presented separately in Appendix B.

1. Wheel Detachment (section I.B.1)

A new performance requirement to address the wheel detachment hazard pattern was approved for publication in ASTM F833-13. This is the first requirement that verifies the strength with which wheels are attached to the stroller. The performance requirement, section 6.9 of ASTM F833-13, states that wheels and swivel assemblies must not detach from the stroller when tested. There are two components to the testing of this performance requirement: (a) wheel detachment from an axle; and (b) swivel wheel assembly detachment from the stroller frame.

The first test, given in section 7.13.1 of ASTM F833-13, begins by describing how a stroller is to be positioned on its side and secured, such that a weight may be suspended from a wheel. This weight must be suspended in a manner that permits the wheel to rotate (see Figure 10). Once the weight is secured, the wheel is to be rotated 360° clockwise and 360° counterclockwise, and this rotation cycle is repeated nine more times. The test weight is 100 lbm. for fixed wheels and 50 lbm. for swiveling wheels.



Figure 10. 100 lbm. suspended from wheel while stroller is secured to a workbench.

Staff developed and validated this test using strollers involved in wheel detachment incidents and new products of the same make and model. Analysis of the international standards indicated that Health Canada SOR/85-379 contained the most stringent wheel attachment requirement (see Table 3, line 3). CPSC Laboratory and Engineering Sciences staff performed the Health Canada

test with a 100 lb. test mass but found that strollers with known wheel detachment field failures passed the test. When staff rotated the wheels while the 100 lbm. was applied, however, incident strollers' wheels detached. This test was repeated with products not known to have wheel detachment issues and they passed. Thus, this test was shown to separate products with known wheel attachment issues from those that do not have attachment problems.

Swivel wheels present a special case. Because they swivel, the side loads that cause detachment from an axle are reduced. If impacted from the side, they will turn, thereby redirecting the impact force away from the wheel-axle joint. Therefore, staff and ASTM stakeholders determined that a 50-lb. test mass was appropriate to evaluate swivel wheels' axle attachment integrity. This test was validated in a manner similar to the 100 lbm. test.

The second test evaluates the integrity of the swivel joint itself. It was developed and validated jointly by staff and ASTM stakeholders. This test applies a 45-lb. force to the swiveling wheel assembly in the direction most likely to detach it from the stroller frame (see Figure 11). This force is maintained for 10 seconds then released.

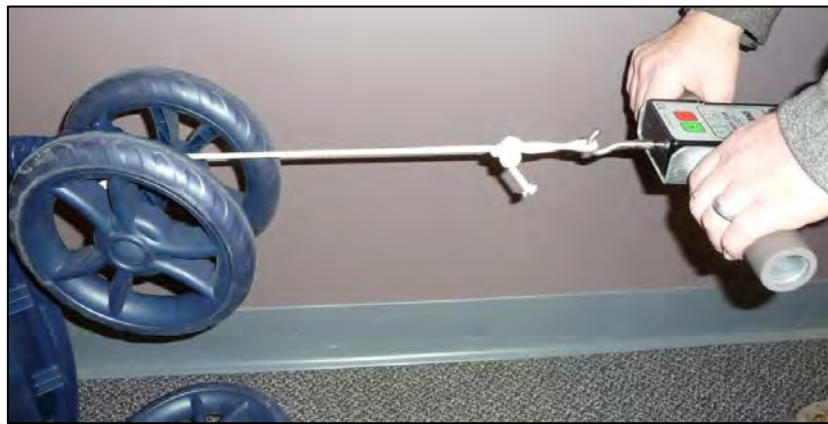


Figure 11. Swivel wheel assembly detachment test.

The incident reports described another wheel detachment scenario in which the front wheel of three-wheeled strollers would separate from the wheel fork. These wheels all had bicycle-style, quick-release wheel hubs that permit fast removal of the front wheel for storage, and when installed properly, allow equally fast and secure reinstallation to the fork. A performance requirement and associated test addressing this issue already exists in ASTM F2680-09, *Standard Specification for Manually Operated Front Wheel Retention Systems for Bicycles*.²⁴ It requires that the secondary locking or retention device required for quick-release wheel hubs hold the wheel in the fork when removal is attempted with 25 lbf. This test was incorporated into ASTM F833-13 section 7.14, along with the associated warning statements and symbols in section 8.2.2.4.

²⁴ ASTM F2680-09, *Standard Specification for Manually Operated Front Wheel Retention Systems for Bicycles*, ASTM International, November 13, 2009.

2. Parking Brakes (section I.B.2.)

The previous parking brake requirement had two parts. First, it stated that the braked wheels may not rotate more than 90° when the stroller, with 40 lbm. secured in the seat, was placed on a 12° incline covered in 120-grit sandpaper. Second, stroller parking brakes must be constructed so that they cannot be disengaged by a child secured in the seat. Staff did not find incidences of the latter in the incident reports; therefore, staff focused on the former requirement, which evaluates the strength of the braking system.

Once again, staff developed and validated a modified performance requirement and associated test using strollers involved in parking brake incidents, new strollers identical to those mentioned in incidents, and strollers known by staff to have robust parking brake systems. The new test failed products with known brake failures in the field and passed products known by staff to lack parking brake issues. The updated performance requirement and associated tests have been approved for inclusion in ASTM F833-13 sections 6.1 and 7.6. The resulting performance requirement is similar—the wheels may not rotate more than 90°—but the test is performed five times, with a force increased approximately 50 percent. The test steps are (*italics indicate a new, more severe update to the test procedure*):

- i. Place stroller on a horizontal surface covered in *60-grit sandpaper*.
- ii. Secure a 40-lb. test mass *or a test mass equal to the manufacturer's recommended maximum weight, whichever is greater*, in each seat.
- iii. Pull forward on the front axle with a *force equal to 34 percent of the mass of the stroller plus test mass(es)*,²⁵ and hold for 10 seconds.
- iv. Pull rearward on the rear axle with the same force, hold for 10 seconds.
- v. *Repeat steps iii. and iv. four more times.*

3. Locking and Latching (section I.B.3., I.B.6., and I.B.11.)

The previous version of the stroller voluntary standard, ASTM F833-11, contains a general requirement in section 5.5 titled, *Latching Mechanisms*. This requirement states that the latching device of foldable strollers must resist unintentional folding when a 45-lb. force is applied to the handles.

The 121 incident reports describe many failure modes involving the folding latches on strollers from more than 20 manufacturers. Some were defective when brand new, many began malfunctioning over time, and others gave no warning prior to their failure. Likewise, the incidents did not follow a consistent use pattern. Many incidents occurred while the caregiver was pushing down on a stroller handle to lift the front wheels over a curb. Others occurred when a child first sat in the seat, or while already seated in the stroller while the stroller was parked. From this great variety of failure modes, staff could draw simply one conclusion: many strollers' locking and latching mechanisms lack sufficient structural integrity. Their locks are not strong enough to survive foreseeable use and abuse.

²⁵ This pull force replicates the force gravity would apply if the stroller and test mass(es) were placed on a 20° incline.

Staff follows the following process when developing new requirements with physical tests for durable children's products:

1. Evaluate the effectiveness of the existing test—do incident samples or products identical to incident samples pass or fail?
 - a. If they pass, go to step two.
 - b. If they fail, go to step four.
2. Evaluate the test procedure—is it inherently flawed? Too gentle? Too severe? Does it not simulate the actual use pattern that caused the failure in the field?
 - a. Experiment with modified test procedures, new fixtures, and equipment—do incident samples or products identical to incident samples pass or fail?
 - b. If the test is sound, go to step three.
3. Increase the existing test's severity—increase the load and/or the duration of the test until incident samples or products identical to incident samples fail.
4. Perform the new test on products with no known issues or related incidents.
 - a. If they fail, the test is too severe. Go back to step 2.
 - b. If they pass, you have developed a good test that filters good products from bad.
5. Write up the test procedure, and send to ASTM stakeholders for further validation, refinement, and language clarification.

This process resulted in a more severe version of the existing locking and latching structural integrity test. Staff recommended to ASTM increasing the force applied to the handle by 50 percent—from 45 lbs. to 67 lbs. Additionally, staff recommended that the test be repeated a total of five times, an increase of three from ASTM F833-11's two force application cycles. This larger force, combined with the three extra repetitions, caused known weak products to fail the test, and yet known good products passed the test. Staff believes that the updated requirement that was approved for inclusion in ASTM F833-13 will significantly reduce the hazard associated with weak lock/latch mechanisms.

Staff evaluated products from several manufacturers that encompassed a broad range of price points. There was one product that failed the recommended test that staff studied in detail. This was the small umbrella stroller shown in Figure 12 (about to undergo parking brake testing). This product is locked into place once erected with a secondary latching device at the bottom of the rear frame. This is a mechanically simple device, just two metal bars hinged together, which is locked into place when pressed from the top with the caregiver's foot, and released by pulling up with the caregiver's foot on the bottom edge. This product supported the new test's 67 lbf. for the first two load applications. During the third load application, the metal bars of the secondary latching mechanism bent rearward. Staff was discouraged that this product failed the new test, but at the same time, staff was impressed by the strength of what appeared to be a delicate product.



Figure 12. Stroller market entry-level product, the umbrella stroller.

The general requirement was also modified during discussions with the ASTM stakeholders. Based on the results of the umbrella stroller tests and other, larger products, the ASTM task group decided to expand the requirement's description of what constituted a satisfactory product. This resulted in two paths—a product could pass the performance requirement after being subjected to the new test (section 5.5.1.2). The first option is that the product must remain latched during the test. This is identical to the existing requirement. The second option permits the product to suffer permanent deformation (like an umbrella stroller's secondary latch bending), rendering it nonfunctional to the consumer, so long as the latches remain engaged.

Staff agreed to this second option because if consumers in the field apply sufficient load to damage their stroller without causing it to fold unintentionally, the hazard would still be avoided. Permanent damage, like bending the secondary latching bars on the umbrella stroller, limits the amount of load the consumer could apply to the product. It is not reasonable to continue increasing the test force beyond this point.

4. Restraint System Buckles (section I.B.4.)

A new performance requirement and associated test has been approved for ASTM F833-13 to address the hazard of children escaping from a stroller when they unfasten the seat restraint system. The new performance requirement (section 6.4.7) and associated test method (sections 7.5.5.2 and 7.5.5.3) state that the restraint system buckle release mechanism must either:

- a) Not release when pressed with a force less than 9.0 lb. if a single-action release mechanism, or
- b) Shall incorporate a double-action release mechanism that does not separate while the buckle's straps are pulled apart with 2.0 lb. of force after one of the two release mechanisms has been released.

The 9-lb. release force is based on the buckle release requirement in the Federal Motor Vehicle Safety Standard (FMVSS) No. 213. (49 CFR 571.213, S5.4.3.5). This new requirement will increase the child resistance of stroller buckle mechanisms, which staff believes should reduce incidents of escape.

5. 3D Stroller Saddle Hinges and Canopy Hinges (sections I.B.5. and I.B.10)

Scissoring, shearing, and pinching hazards, addressed in ASTM F833-11 section 5.7, only consider the static environment of a fully erected stroller locked into the manufacturer's recommended-use position. Nearly every injury involving a stroller hinge was caused by stroller parts moving relative to one another. Therefore, it was clear to staff that the dynamic environment of a stroller beginning unfolded and erected for use should be incorporated into the performance requirement.

A scissoring, shearing, or pinching hazard is said to exist when the edges of rigid parts admit a 0.210-in. (5.33-mm) diameter probe but do not admit a 0.375-in. (9.53-mm) diameter probe. In essence, if a small, child-size finger (0.210 in. diameter) can fit in between two rigid edges, the edges must be separated by a distance large enough to permit the finger to be withdrawn (0.375 in.).

There are three prominent hazard scenarios known to staff from our review of the incident reports and past recall actions by the CPSC Office of Compliance. Two of the hazards scenarios are presented below, along with the changes approved for ASTM F833-13 to address them. The third hazard scenario is addressed in Appendix B, which presents the staff-recommended modification to the voluntary standard.

a) Saddle Hinges

Saddle hinges (Figure 13) form a guillotine-like interface that has amputated the fingers of children younger than 5 years of age. The hinged frame tube rotates into place and is secured between two walls that protrude from the hinge. If a finger is in the slot where the tube will come to rest, the finger can be crushed. If the finger lies across one or both of the walls, it can be severed (see straight arrow in Figure 13). Typical injury scenarios include a child placing their hand on the hinge while helping the caregiver erect it unbeknownst to the caregiver; and the child placing one or both hands on not fully closed hinges while sitting in the seat and the weight of their body closes the hinge. The crushing and shearing hazard posed by saddle hinges has led to six recalls of 2,081,100 3D strollers since 2009.

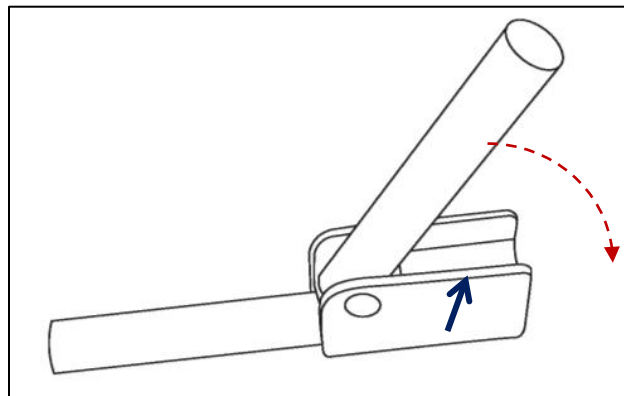


Figure 13. Saddle hinge. A finger inside the channel can be crushed; a finger laid across the wall (straight arrow) can be severed.

This hazard is addressed with the new language in section 5.7.2, which states that 3D saddle hinges must be constructed to prevent injury from scissoring, shearing, or pinching. The new test is dynamic. The stroller is partially unfolded so that the main side rail tubes are positioned 90° to one another. Saddle hinge scissoring, shearing, and pinching conditions are checked for with the two probes (0.210 in. and 0.375 in. diameter) while opening the stroller into the manufacturer's recommended open and locked position.

b) Canopy Hinges

The second prominent scissoring, shearing, and pinching hazard pattern involves the motion of stroller canopy support frames. Canopies are included on strollers to shield the occupant(s) from the sun and inclement weather conditions. Their shape is maintained through the use of thin, flexible plastic or metal strips or rods called "spreaders." The spreaders are connected at their ends, allowing them to fan apart when the canopy is extended, yet securely attach the canopy to the stroller frame. Other canopy designs have a single, larger member called a spreader "rod" sewn into the front edge of the canopy to maintain its shape. The frame attachment point is generally located near the height of the occupant's head or shoulder, and therefore, it is accessible to their hands (for examples, see Figures 1, 3, 4, and 5). Scissoring, shearing, and pinching injury scenarios often involve a child inserting a finger between:

- i. Two spreaders
- ii. The spreader and stroller frame
- iii. The spreader rod and the spreader rod positioning bracket (which holds the canopy in two or more positions).

The only common thread among the injuries is that the canopy was either being opened or closed when the injury occurred and that the majority of injuries occurred close to the canopy pivot (frame attachment point). The crushing and shearing hazard posed by the canopy has led to one recall of 1.5 million strollers since 2008.

A new general requirement and test developed by staff and the ASTM task group was included with the saddle hinge ballot and approved for publication in ASTM F833-13 (sections 5.7.3 and 7.16.2). The new requirement's language is nearly identical to the 3D saddle hinge requirement but deals specifically with canopies. It also lists two exemptions to the requirement, canopy stretchers (Figure 14a) and canopy rod stops (Figure 14c), which the rod rests against when fully open but does not pass by or through. Stretchers are exempted because they are a safer alternative to the brackets and latches otherwise used to secure a canopy in the open position. Alternative devices have caused injuries that led to voluntary recalls of approximately 1.5 million strollers in 2010.²⁶ Rod stops are exempted if they are only used as a resting location for the same reason. When stroller canopy designs incorporate a motion that requires the rod to pass by or through

²⁶ News from CPSC, "Graco Recalls Strollers Due to Fingertip Amputation and Laceration Hazards," [Release #10-115](#), January 20, 2010.

another rigid part, scissoring and shearing hazards can be created (see Figure 14b). The new test (section 7.16.2) checks for a hazardous condition between exposed, rigid canopy spreaders, rods, and the stroller frame within 4 in. of the canopy pivot. This is performed while articulating the canopy through its full range of motion.



Figure 14a. Canopy stretcher (arrow). Fig. 14b. Hazardous method to secure canopy rod.

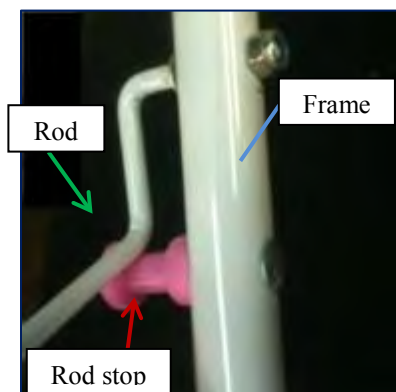


Figure 14c. Canopy rod and rod stop.

6. Stability (section I.B.7.)

Performance requirement 6.3, *Stability* in ASTM F833-11, was strengthened by closing loopholes related to the climbing-in stability of strollers with swiveling seats and clarifying the associated test procedure. There are two components to the stability performance requirement approved for ASTM F833-13. First, the stroller with a 17.4-lbm. CAMI infant test dummy secured in each seat is placed in various orientations on a 12° inclined plane. The requirement states that it shall not tip over when placed in any orientation to the incline. The second component evaluates a stroller's resistance to tipping over when a child climbs into the seat. This is done by applying a downward force of 40 lb. to the structural member (typically a foot rest) in front of the seat.

Previously, the climbing-in procedure test assumed that all seats would be forward facing. New test procedure language was added in ASTM F833-13 section 7.4.2.3 to account for strollers that have rearward or swiveling seats that can face multiple directions. The test now must be

performed with the seat(s) in every position recommended by the manufacturer that allows a child to climb in. Section 7.4.2.2 describes where the 40-lb. test force is to be applied. In ASTM F833-11 and earlier versions it was to be applied at the centerline of the stroller. The updated ASTM F833-13 language requires the test load to be applied to any structural member of the stroller “forward of the front edge of the seat *on any location likely to cause the unit to tip*” (emphasis added). This ensures that the test is executed in the most severe manner possible, resulting, staff believes, in a more stringent stability performance requirement.

7. Head Entrapment (section I.B.8.)

Two of the four fatalities involving strollers were strangulations that resulted from a child’s head becoming entrapped between two rigid components of a stroller. In the first incident, the victim’s head was entrapped between the stroller seat and the tray/grab bar. This occurred in a recalled product and was already addressed by the ASTM F833-11 section 6.8 performance requirement, *Passive Containment/Foot Opening*, and the associated test in section 7.12. A stroller meets this requirement by having a bounded opening between the seat and tray/grab bar through which a larger child-size head probe can pass if a small, child-size torso probe can also pass. The head and torso probes are shown in Figure 15. In the second incident, a 5-month-old victim was found dangling with his head wedged between the rearward-facing car seat attached to the stroller and the stroller handle. This scenario of a bounded opening created by a stroller and a handheld carrier/car seat was not addressed by the voluntary standard prior to ASTM F833-13.

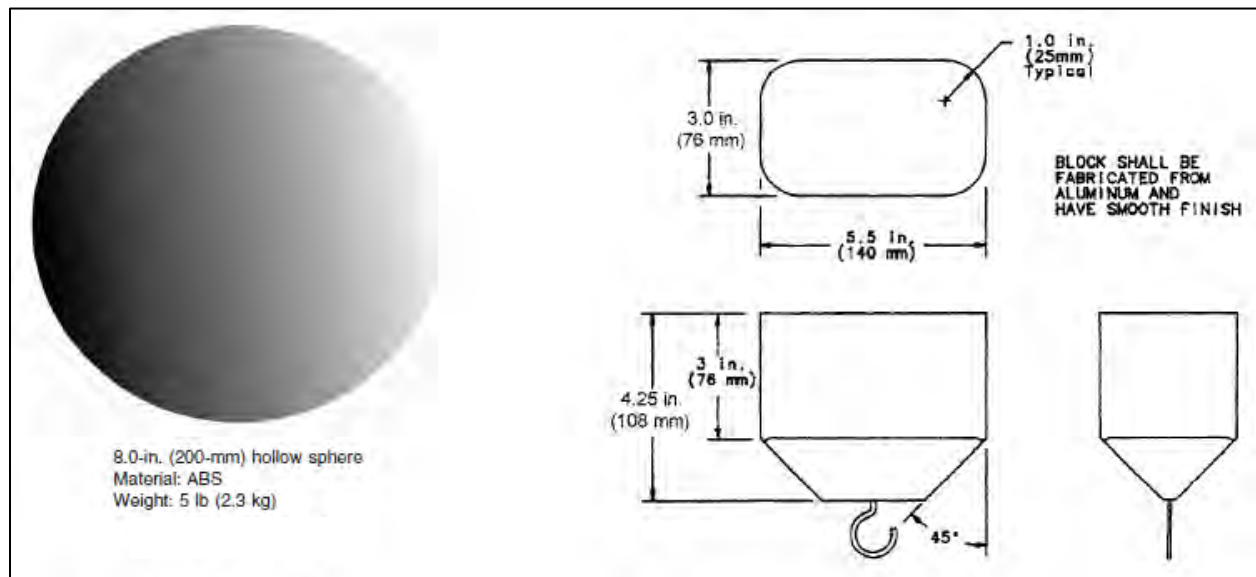


Figure 15. Probes used to evaluate bounded openings for a head entrapment hazard.

A new performance requirement was developed by staff and the ASTM task group members to address entrapment between the foot-end of a handheld carrier/car seat and the stroller structure. The requirement is functionally identical to the anti-entrapment requirement described above for the front edges of seats and trays/grab bars. If a small child’s torso can fit through the bounded opening created by the foot-end of a handheld carrier/car seat and the adjacent stroller structure, a large child’s head must also pass through. This requirement has been approved for inclusion in ASTM F833-13.

The requirement is complicated by the provision that only an opening within 5" above the foot-end of the handheld carrier/car seat shall be tested. What this means is that, unless there is a foot-end barrier that extends at least 5" above the foot-end of the seat, the unit must pass the head entrapment test. Evaluating any bounded opening within 5" is more stringent than the existing retention evaluations found in the Australia/New Zealand and European mandatory standards. AS/NZS 2088:2009 evaluates head end barrier using a 3" diameter probe, while EN 1888:2012 evaluates seat barriers using a 4.75" diameter ball. The approved ASTM test suspends a 5-lb. mass from the barrier when performing the measurement to determine the height of the foot-end barrier. These barriers are often made from textiles strung between the stroller frame side rails and will deflect when loaded, thereby reducing the effective height of the barrier. This yields a more severe requirement than if the weight were omitted.

8. Cord and Strap Length (section I.B.10.)

The voluntary stroller standard did not address the strangulation hazard of cords and straps in the occupant space until this new performance requirement and associated test were approved for ASTM F833-13. The need arose as a result of a near-strangulation when a child wrapped a cord around her neck while secured in the stroller seat. The cord was used to retract the canopy but could be pulled into the occupant area. This incident led to a February 2011 voluntary recall by the manufacturer of about 337,000 jogging strollers.²⁷

An ASTM task group was formed shortly thereafter to develop a cord and strap requirement for ASTM F833 that would address this type of strangulation hazard. The resulting general requirement is approved for ASTM F833-13 in section 5.13 *Cord/Strap Length*, along with the associated test in section 7.15 *Cord and Strap*. The standard requires cords and straps that originate within or are long enough to enter into the occupant space not to create a loop large enough for a child's head to pass through (maximum inner diameter of 14.8 in.; 376 mm), nor be long enough to wrap around a child's neck (maximum stretched, free length of 7.4 in.; 188 mm). Several exemptions to this requirement are granted, which serve to ensure the initial hazard (a canopy cord) is addressed without banning other cords and straps that have not been shown to be hazardous. The exempted straps and cords are:

- i. Restraint system straps used to secure an occupant;
- ii. Straps used to attach hand-held infant carriers/car seats to the strollers and on handheld infant carriers/car seats; and
- iii. Straps that tether the caregiver pushing the stroller to the stroller frame.

Exemption iii. was included because the Australia/New Zealand stroller standard, AS/NZS 2088:2009, requires all strollers to have a tether strap. Use of this strap prevents strollers from rolling into an unsafe environment (*e.g.*, parking lot, street) if the caregiver accidentally loses their grip on the handle. Staff believes that this new requirement adequately addresses the strangulation hazard pattern that poses the most immediate threat to stroller occupants and that led to the 2011 recall.

²⁷ Joint News Release from CPSC and Health Canada, "Jogging Strollers Recalled by B.O.B. Trailers Due to Strangulation Hazard," [Release #11-143](#), February 23, 2011.

Appendix B: Staff's Recommendation for 2D Frame Folding Pinch Hazards

Presented below are the specific requirements that staff recommends adding to ASTM F833-13 to address 2D stroller pinch points.

3.1.x 2D fold stroller – a stroller that folds the handlebars and leg tubes only in the front-to-back (or back-to-front) direction

5.7 Scissoring, Shearing, and Pinching:

5.7. 4 The frame folding action of a 2D fold stroller and convertible carriage/stroller (not a carriage) shall be designed and constructed so as to prevent injury from scissoring, shearing, or pinching. Scissoring, shearing, or pinching that may cause injury exists when the edges of the rigid parts admit a 0.210-in. (5.33-mm) diameter probe but do not admit a 0.375-in. (9.53-mm) diameter probe when tested in accordance with 7.15. Units with a removable seat that prevent the complete folding of the unit when still attached are exempt from this requirement. Note: The evaluation at any given location is performed with the understanding that the probes are allowed to enter the location from any angle/direction.

7.18 Frame Folding Scissoring, Shearing, and Pinching

7.18.1 Frame folding or folding frame stroller and convertible carriage/stroller evaluation: Place the unit's seatback in the most upright position. Identify and mark the portion of the unit's rigid frame members and hinges that have potential scissoring, shearing, or pinching action during folding of the unit and are within or penetrate the access zone shown in Fig X anywhere within the width of the stroller. All marked portions of the frame shall be evaluated per 7.18.2 or 7.18.3 as applicable. For units that feature two or more folding operations that are able to be carried out independently of each other, each operation must be independently evaluated per the test methods in 7.18.2 and/or 7.18.3 as applicable. This includes all seat-facing positions as recommended by the manufacturer and each occupant position on multiple occupancy units. Tray and front grab bar movements not a result of unfolding operation are excluded from this evaluation.

7.18.2 For units where the front and rear wheels move toward each other during folding - measure the change in distance (see Fig. Y) between the front and rear wheel axle centers when moving from the completely folded to completely erected position. The measurement shall be taken with any swivel wheels in the locked position and in the plane where the axle centerlines are perpendicular to the fore/aft horizontal axis of the stroller. To determine the starting point for testing, start folding the unit from erect to folded/"closed" position until the distance between the wheel axle centers is 2/3 of the total travel distance (see Figure Y for an example). From this point check the marked portions identified in 7.18.1 for scissoring, shearing and pinching in accordance with 5.7.4 while moving the stroller from this partially folded position to the fully erect and locked position.

7.18.3 For units where the front and rear wheels axle centers move away from each other or do not change distance during folding - place the unit in a partially erect position so the handle tube is rotated 90 deg. from the fully erect and locked position-perpendicular to the front leg tube. From this point assess the marked portions identified in 7.18.1 for scissoring, shearing and pinching in accordance with 5.7.4 while moving the unit from this partially folded position to the fully erect and locked position.

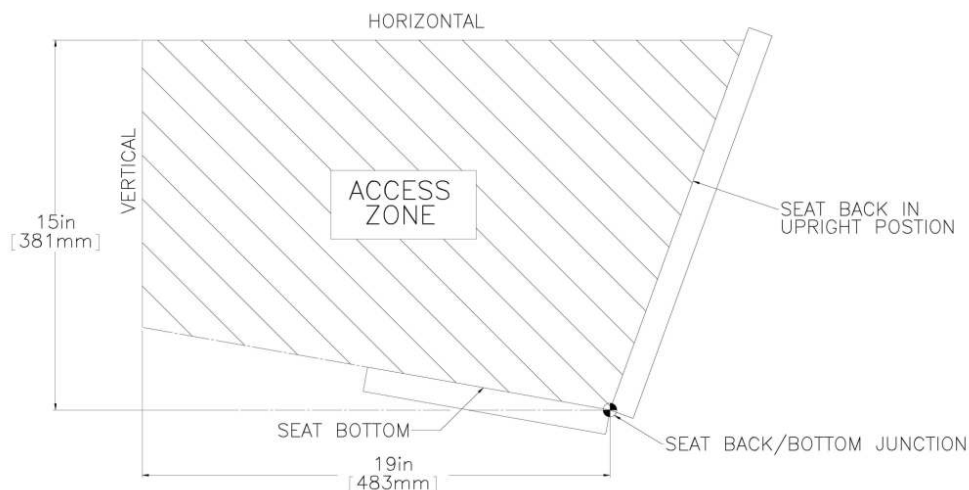


Figure X. Access zone

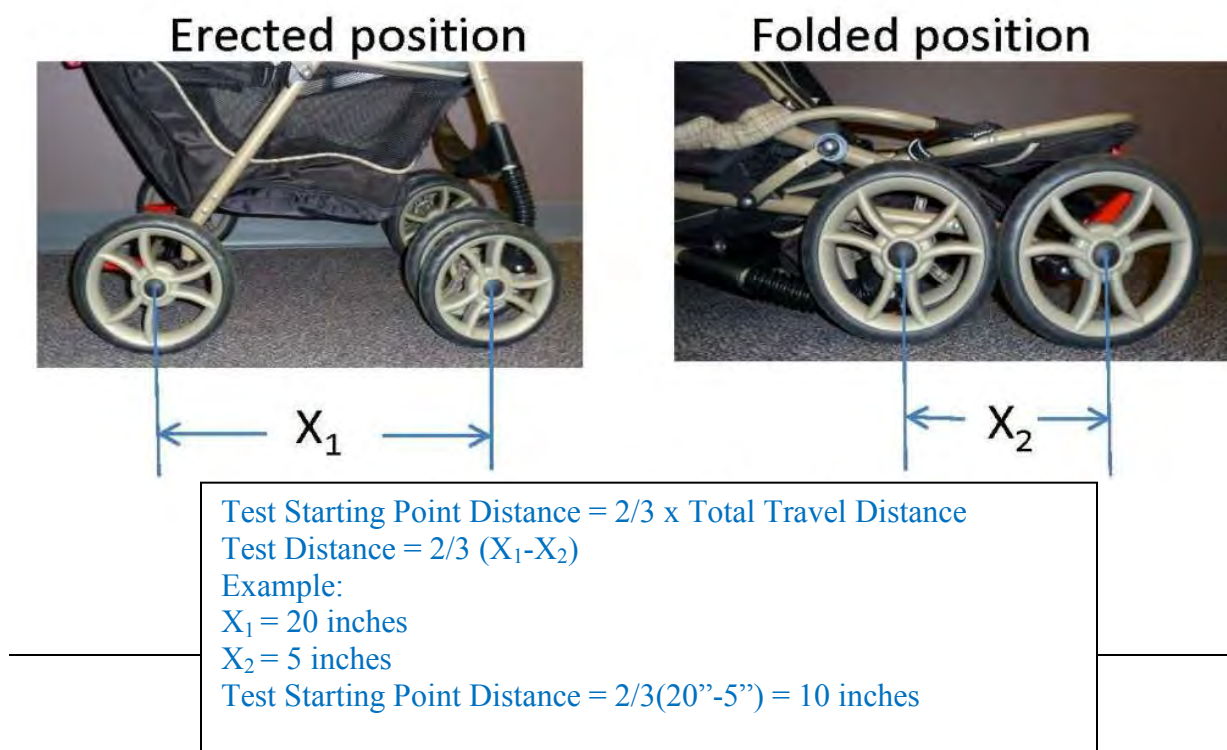


Figure Y. Example of travel distance calculation

Rationale 7.18: A 3 year old child's sitting shoulder height is 15 inches and upper limb length is 19 inches based on 95th percentile 3-year-old child's measurements (Pheasant, S.T. (1996). *Bodyspace: Anthropometrics, Ergonomics and the Design of Work* (2nd ed.). London, UK: Taylor & Francis.). The access zone covers a child sitting in the most upright position reaching forward hence the reason for defining 19" from the seat back junction.

TAB C: Stroller-Related Deaths and Injuries

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UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MARYLAND 20814

Memorandum

Date: April 2, 2013

TO : Rana Balci-Sinha, Ph.D.
Strollers Project Manager
Division of Human Factors
Directorate for Engineering Sciences

THROUGH: Mary Ann Danello, Ph.D., Associate Executive Director
Directorate for Health Sciences

Jacque Ferrante, Ph.D., Division Director
Division of Pharmacology and Physiology

FROM : Stefanie Marques, Ph.D., Physiologist
Division of Pharmacology and Physiology

SUBJECT : Stroller-Related Deaths and Injuries

Introduction:

Section 104 of the Consumer Product Safety Improvement Act of 2008 (CPSIA), *Standards and Consumer Registration of Durable Nursery Products*, requires the U.S. Consumer Product Safety Commission (CPSC) to assess the effectiveness of voluntary consumer product safety standards for durable infant and toddler products and to promulgate mandatory safety standards. The Commission is charged with promulgating consumer product safety standards that are substantially the same as the voluntary standards for strollers or more stringent than the voluntary standard if the Commission determines that more stringent standards would further reduce the risk of injury associated with strollers. Section 104 of the CPSIA also requires the Commission to consult with representatives of consumer groups, juvenile product manufacturers, and independent child product engineers and experts to examine and assess the effectiveness of the voluntary standards. Strollers are one of the products specifically identified in section 104(f) (2) of the CPSIA as a durable infant or toddler product.

A "stroller" is defined in the ASTM voluntary standard F833-13 as a wheeled vehicle for the transport of infants or children generally in a sitting up or semi-reclined position. It is intended for use for children from infancy to 36 months of age. Strollers are powered by a person or persons pushing or pulling on the handle of the product, and strollers are usually able to fold for storage.

THIS DOCUMENT HAS NOT BEEN REVIEWED
OR ACCEPTED BY THE COMMISSION

THIS DOCUMENT HAS NOT BEEN REVIEWED
OR ACCEPTED BY THE COMMISSION.

CLEARED FOR PUBLIC RELEASE
UNDER CPSA 6(b)(1)



UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814

MEMORANDUM

This memorandum provides information on deaths and injuries associated with the use of strollers. Three CPSC databases²⁸ covering the period from January 1, 2008 through December 31, 2012, were searched for incidents involving strollers (Qin, 2013).²⁹ There were a total of 1,207 incidents related to strollers that involved children 4 years old or younger. Of the 1,207 reported incidents, four were fatalities and 359 were nonfatal injuries. There were an estimated 46,200 injuries treated in U.S. hospital emergency rooms from January 2008 to December 2011, as determined from data in the National Electronic Injury Surveillance System (NEISS). According to Qin (2013), issues involving stroller wheels contributed to the most incidents.

Health Sciences' review of fatalities and discussion of hazard patterns:

There were four reported fatalities involving strollers during the time period January 1, 2008 to December 31, 2012. One incident lacks information to determine if the stroller directly contributed to the incident; it involved a 20-month-old who drowned when the umbrella-type stroller he was harnessed in fell off a dock into a bay. The coroner's investigator determined that the brakes of the stroller were not engaged. The remaining three fatalities appear to directly involve a stroller. One incident involved a stroller that was not in use. In this case, a 4-year-old boy climbed into a folded, unlocked stroller; the stroller collapsed and wedged the child's chest between the folded stroller structures. The child was not found immediately and died of compressional asphyxiation.

The two remaining fatalities involved strollers that were being used as alternative sleeping environments. One of these incidents involved a 5-month-old infant who was placed supine in a car seat/stroller travel system to sleep. The infant was sleeping in the stroller for more than 3 hours when he was discovered with his head trapped in an opening created by the edge of the car seat and a metal bar just below the cup holder tray of the stroller. It appeared that the infant had woken up and managed to turn over on his stomach and wiggle off the edge of the car seat; the gap between the car seat edge and stroller tray allowed the infant's body to pass through but was not large enough to allow his head to pass through. The second incident also involved a 5-month-old boy; in this incident the infant was placed prone on a blanket in a stroller that had previously been recalled due to clearance issues. The child was left napping unattended for approximately 30 minutes when he was found face down in the seat of the stroller with his head trapped in an opening created by the stroller seat and the stroller tray. In both of these fatalities the infants were sleeping in the strollers unrestrained.

²⁸ The CPSC databases searched were the In-Depth Investigation (INDP) file, the Injury or Potential Injury Incident (IPII) file, and the Death Certificate (DTHS) file. These reported deaths and incidents are not a complete count of all that occurred during this time period. However, they do provide a minimum number of deaths and incidents occurring during this time period and illustrate the circumstances involved in the incidents related to strollers.

²⁹ Memorandum from Angie Qin to Rana Balci-Sinha, "Stroller-Related Deaths, Injuries, and Potential Injuries; January 2008–December 2012," April 2, 2013.



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BETHESDA, MD 20814

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Health Sciences' review of nonfatal incidents and discussion of hazard patterns:

A total of 1,203 nonfatal incidents associated with strollers were reported to CPSC staff from January 1, 2008 through December 31, 2012 (Qin, 2013), involving children 4 years old or younger. The 1,203 reports included 359 reports of injuries. The majority of the injuries were minor, such as bruising, abrasions, and cuts. However, there were 70 incidents that resulted in moderate and severe injuries, such as lacerations requiring stitches, tooth extractions, fractures, head injuries, and partial amputations of fingers. Although most of the reported stroller incidents involved wheel issues (Qin, 2013), the majority of the moderate and severe injuries (41 injuries, 59 percent) were the result of hinge issues (Figure 1). All of the hinge-related moderate and severe injuries involved fractures or partial amputations of the child's finger.

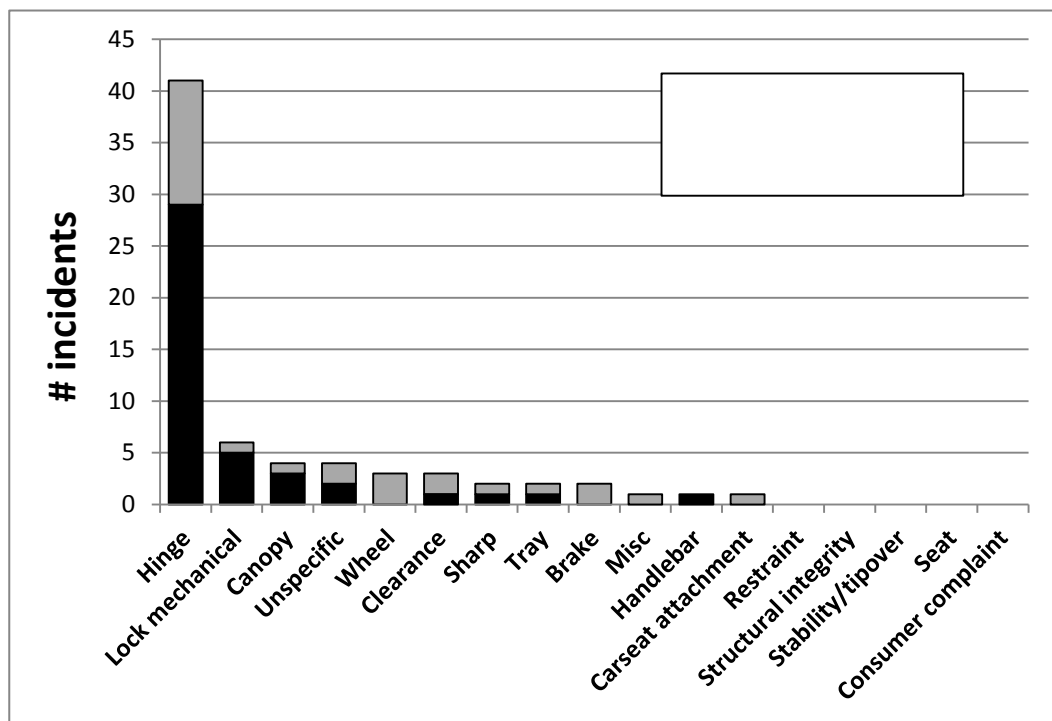


Figure 1. Stroller-related moderate and severe injuries sustained by children 4 and younger summarized by stroller issue.

Twenty-six (63 percent) of the 41 hinge-related moderate and severe injuries occurred when a caregiver was unfolding the stroller for use and the child was outside the stroller; usually the child was nearby the stroller waiting to sit down. Three incidents involved children who were outside the stroller as the caregiver was folding up the stroller after use. Three incidents resulted in an injury to the child's finger when the stroller collapsed while the child was in the stroller. One incident involved a caregiver who partially folded the stroller while the child was seated in the stroller resulting in the child injuring their finger in the exposed gap at the hinge. In the



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remaining eight incidents, it is not clear whether the child was in or out of the stroller, or how the care giver was manipulating the stroller when the injury occurred.

HS staff determined that approximately 63 percent of the injuries reported through NEISS were the result of the child falling out of the stroller. Due to the limited information available through NEISS, it could not be determined whether the strollers' restraint system was used in these incidents. Approximately 11 percent of the injuries reported through NEISS were the result of the stroller falling over, and approximately 5 percent of the injuries were the result of a child's body part being caught on the stroller (most of these injuries involved fingers getting caught in the stroller).

There were 78 reported stroller incidents that involved injuries to children older than 4 and adults; 20 of these injuries were moderate and severe. Twelve (60 percent) of the moderate and severe injuries were sustained when the adult care giver was folding or unfolding the stroller. Five of the moderate and severe injuries were the result of wheel issues, including two incidents in which the wheel detached from the stroller and severely injured older children (8 and 10 years old) who were pushing the strollers. The remaining moderate and severe injuries were the result of removing the stroller from the car (1); grip issues (1); and sharp edges on the stroller (1).

Health Sciences' conclusion:

Clearance issues were clearly a factor in two of the four fatalities involving strollers. It is HS staff's opinion that the two fatalities involving infants who were placed to sleep in the stroller could have been avoided if the gaps created by the stroller structures or the combination of the stroller and car seat structures in travel systems were not accessible to the infant when placed in the product. If the design of the product cannot eliminate accessible gaps, then it is HS staff's opinion that these gaps must be small enough to prevent the passage of an infant's torso, or large enough to allow for the passage of both the infant's torso and head to preclude the infant's head from becoming entrapped, as described in the incidents.

Gaps or pinch points created by the stroller hinge that are accessible to both children sitting in the stroller or about to sit in the stroller and adults setting up or putting away the stroller (unfolding and folding) were the biggest contributors to moderate and severe nonfatal injuries. The majority of these incidents resulted in fractures or partial amputations of fingers to children and adults. It is HS staff's opinion that minimizing the gaps or pinch points around the occupant area of the stroller would greatly reduce the likelihood that children and adults would sustain moderate and severe finger injuries.

TAB D: Human Factors Assessment of Hazard Patterns and Mitigation Strategies in Strollers

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UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MARYLAND 20814

Memorandum

Date: April 2, 2013

TO : Rana Balci-Sinha, Ph.D.
Project Manager, Directorate for Engineering Sciences

THROUGH: George A. Borlase, Ph.D., P.E., Associate Executive Director
Directorate for Engineering Sciences

Celestine T. Kiss, Interim Director
Division of Human Factors, Directorate for Engineering Sciences

FROM : Jonathan Midgett, Ph.D.
Engineering Psychologist, Office of Hazard Identification and Reduction

SUBJECT : Human Factors Assessment of Hazard Patterns and Mitigation Strategies in
Strollers

Introduction

Section 104 of the Consumer Product Safety Improvement Act of 2008 (CPSIA), known as the Danny Keysar Child Product Safety Notification Act, requires the U.S. Consumer Product Safety Commission (CPSC or Commission) to promulgate consumer product safety standards for durable infant or toddler products. These standards are to be “substantially the same as” applicable voluntary standards or more stringent than such standards if the Commission determines that more stringent standards would further reduce the risk of injury associated with these products. Section 104(f) defines a “durable infant or toddler product” as a durable product intended for use, or that may be reasonably expected to be used, by children under the age of 5 years, and includes strollers (104(f)(2)(I)).

The ASTM voluntary standard, ASTM F833-13, *Standard Consumer Safety Performance Specification for Carriages and Strollers*, establishes requirements for carriages and strollers to minimize potential safety hazards associated with stability, brakes, restraint systems, latches and folding mechanisms, and structural integrity, as well as deaths due to entrapment in openings of convertible carriage/strollers (ASTM International, 2013). Staff recommends that the Commission issue a proposed rule that would adopt the requirements in ASTM F833-13. In addition, staff recommends that the proposed rule add a new performance requirement and test procedure to address scissoring, shearing, and pinching hazards associated with 2D fold strollers.

“Strollers” are defined in the voluntary standard as a wheeled vehicle to transport infants and children generally in a sitting-up or semi-reclined position. Carriages transport children in a fully reclined position. The person who is pushing the stroller, at a walking rate or faster, as in the case of a jogging stroller, supplies the motive power. Strollers and carriages generally are used for children from infancy to 36 months of age.

This memorandum provides human factors assessment of relevant hazard patterns and mitigation strategies associated with strollers.

Hazard Patterns and Human Factors Issues

Wheel Issues

Wheel issues, such as broken wheel rims, detached wheels, or burst tires, constituted the highest number of incidents reported to CPSC. In response to the incidents reported, an ASTM task group developed requirements to test detachment of the wheels and swivel assembly.

In addition to the performance requirements, the standard requires that the products with a removable wheel fork assembly have warning statements that address the need to follow carefully instructions for wheel assembly and locking. These two new warning messages explain the nature and consequences of the hazard and give instructions on how to avoid the hazard. The reminder to lock swiveling front wheels before running, jogging, or walking fast is located conspicuously.

The ASTM F833-13 standard also requires that products with a removable wheel fork assembly shall have instructions to describe the procedure for proper assembly and maintenance of these mechanisms and assemblies. The performance requirements, warnings, and instructions are similar to the injury-prevention strategies used in other standards for products with quick-release wheels, such as bicycles. Staff supports these new performance and labeling requirements for addressing wheel detachment.

Hinge Issues

The highest number of injuries reported to CPSC resulted from children’s fingers becoming caught, lacerated, or amputated. To address this hazard, the ASTM standard has a new requirement for saddle hinge links on strollers that fold in three dimensions (3D fold). In addition, the new standard addresses the canopy pivots and canopy frame members to address potential injuries associated with canopy fold. For strollers that fold in two dimensions (2D fold), an ASTM task group developed requirements to test the hinges and rigid frame members that are within or penetrate the occupant access zone. The occupant access zone is defined by the area calculated from the sitting shoulder height and upper limb length of a 95th percentile 3-year-old child (Pheasant, 1996). Even though the occupant access zone does not extend vertically above the shoulder height, the newly added section on canopy pivots and frame members (5.7.3) should capture the hazardous areas that are within the canopy fold. Staff believes that most of the finger

injuries can be addressed by adopting ASTM F833-13, with the addition of a new hinge requirement for 2D fold strollers in the proposed rule.

Cords and Straps

An ASTM task group developed requirements that will eliminate both cords or straps that are long enough to be wrapped around the child's neck and loops that can be inserted over a child's head. For this purpose, an "occupant space" is defined, which is the volume created by projecting the inside area of the pad surface 22 inches in the upward direction for carriages and 22 inches upward and 5 inches measured orthogonally outward from the seat's edges for strollers. The ASTM task group selected the 22-inch requirement to align with a similar requirement in EN 1888:2012 - *Child Care Articles - Wheeled Child Conveyances*. This measurement approximates the sitting height of the majority of potential occupants. Staff believes that the defined occupant space should capture the potentially hazardous loops or cords/straps that are a hazardous length. Harness straps to secure the occupant, carrying straps, and tether straps are exempt from this requirement. CPSC staff did not receive any reports with strangulation injuries associated with those straps in strollers.

Restraint Issues

According to the incident data, various children were able to release the buckle of the restraint system. To address this hazard, an ASTM task group developed requirements to have a single-action release mechanism that does not release at a force less than 9 lbf or else have a double-action release mechanism. The majority of these requirements are already included in the National Highway Traffic Safety Administration's (NHTSA) standard for child restraint systems, Federal Motor Vehicle Safety Standard (FMVSS) No. 213 (49 CFR 571.213, S5.4.3.5 and S6.2.1). Staff supports these recent additions to the ASTM standard.

Head Entrapment (Clearance Issues)

Travel systems that combine a stroller with a rear-facing car seat may create a hazardous opening. One fatality resulted from such a combination. The latest standard added a new test method to identify openings and to ensure that they are not hazardous (*i.e.*, both torso and head probes pass through such openings, or neither one can, to prevent head entrapment.)

Lock Mechanism

ASTM increased the testing force from 45 lbf to 67 lbf. Staff supports this increase in the required force because it is more protective. The new force was based on testing of products known to produce incidents with an added factor of safety.

Adult Injuries

Adult caregivers also may be injured by strollers during assembly and use, such as when the stroller is folded, stowed in a car trunk, and subsequently removed. Strollers that open or close

with a motor-assist have crushed user fingers between parts of the stroller. In two cases, consumers were only able to free their fingers with another adult's help.

The ASTM standard does not currently address such hazards. However, the new requirements that prevent lacerations in hinges will cover close to half of the incidents associated with adult finger entrapment. The incidents that the new hinge requirements will now cover occurred in places other than the hinges. The incidents caused by strollers with motor-assisted folding mechanisms can be addressed through other regulatory methods, such as recalls.

References

Pheasant, S.T. (1996). *Bodyspace: Anthropometrics, Ergonomics and the Design of Work* (2nd ed.). London, UK: Taylor & Francis.

TAB E: Durable Nursery Products: Summary of Stroller Injuries, Recalls, and Defect Investigations from January 1, 2008 to December 31, 2012

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**UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MARYLAND 20814**

Memorandum

Date: April 2, 2013

TO : Rana Balci-Sinha, Ph.D.
Stroller Project Manager
Division of Human Factors

THROUGH: Marc J. Schoem, Acting Assistant Executive Director,
Office of Compliance and Field Operations

Mary F. Toro, Director, Division of Regulatory Enforcement,
Office of Compliance and Field Operations

Carolyn Manley, Team Lead, Division of Regulatory Enforcement,
Regulated Children's Products,
Office of Compliance and Field Operations

FROM: Mike Lee, Compliance Officer, Regulated Children's Products,
Division of Regulatory Enforcement,
Office of Compliance and Field Operations

SUBJECT : Durable Nursery Products: Summary of Stroller Injuries, Recalls, and
Defect Investigations from January 1, 2008 to December 31, 2012

PURPOSE

This memorandum provides compliance information relevant to the drafting of a safety standard for strollers. Section 104 of the Consumer Product Safety Improvement Act of 2008, Pub. L. No. 110-314, 122 Stat. 3016 (August 14, 2008) (CPSIA), also known as the Danny Keysar Child Product Safety Notification Act, requires the Commission to study and develop safety standards for durable infant and toddler products, which includes strollers. CPSC staff is drafting a proposed rule for a mandatory stroller standard for Commission consideration. A revised version of the current stroller voluntary standard, ASTM F833-13, is expected to form the basis for the proposed rule. This memo summarizes the product safety recalls and defect investigations conducted by the Office of Compliance and Field Operations (Compliance) and the reported injuries involving strollers.

COMPLIANCE INVESTIGATION INFORMATION

Since January 1, 2008, there have been 29 stroller recalls involving 15 different firms. The recalled products referenced were responsible for hundreds of injuries, including fatalities and amputations. A few of the reported injuries were to adults. The injuries were primarily to fingers which were crushed, lacerated, and, in one case, amputated. The table below lists the details of the recalls conducted. The hazard patterns identified through the EXC data review are consistent with the patterns identified through review of EPI data. In addition, we have investigated or are currently investigating strollers that have been reported to include similar hazards to the ones identified below.

Stroller Recalls January 1, 2008 to December 31, 2012

Date	Firm	Reason	# Recalled	Press Release #
08/28/2008	Regal Lager	Finger lacerations	44,000	PR08377
12/17/2008	Regal Lager	Handle bar breakage	1,600	PR09067
06/02/2009	Bugaboo	Brake failure	22,500	PR09233
08/27/2009	Baby Jogger	Buckle breakage	41,000	PR09334
11/09/2009	Maclaren	Finger amputation	1 mil	PR10033
01/20/2010	Graco	Finger lacerations	1.5 mil	PR10115
01/27/2010	Regal Lager	Finger lacerations	1,100	PR10123
02/10/2010	Britax	Finger lacerations	14,000	PR10137
08/19/2010	Lan Enterprises	Lock failure	3,700	PR10321
10/06/2010	Tike Tech	Head entrapment	800	PR11002
10/06/2010	Valco Baby	Head entrapment	12,000	PR11003
10/20/2010	Graco	Head entrapment	2 mil	PR11015
01/21/2011	phil&teds	Amputation/laceration	22,000	PR11106
02/23/2011	B.O.B.	Strangulation hazard	337,000	PR11143
03/01/2011	Baby Jogger	Fall hazard	1,545	PR11145
05/12/2011	Maclaren	Amputation/laceration	1 mil	PR11222
05/27/2011	Lan Enterprises	Strangulation hazard	2,300	PR11225
06/23/2011	Britax	Brake failure	20,000	PR11256
07/28/2011	phil&teds	Brake failure	7,400	PR11288
10/11/2011	B.O.B.	Choking hazard	411,700	PR12006
12/22/2011	Bugaboo	Fall hazard – Wheel lock	7,000	PR12066
12/22/2011	Bugaboo	Fall hazard-Seat disc	64,000	PR12067
02/03/2012	Bumbleride	Fall hazard –wheel break	28,000	PR12104
02/23/2012	Kelty	Fall hazard – wheel sep	3,000	PR12116
06/14/2012	Kolcraft	Amputation/laceration	36,000	PR12196
07/24/2012	Peg Perego	Strangulation hazard	223,000	PR12232
07/24/2012	Kolcraft	Fall and choking hazard	5,600	PR12233
10/23/2012	ValcoBaby Booster	Fall hazard	975	PR13012
12/12/2012	Baby Jogger	Fall hazard/frame lock	8,400	PR13065
Total			6.82 mil	

Compliance staff's review of the Epidemiology incidents lists 17 components presenting various hazards. Eight of these encompass more than 80 percent of the incidents. In order, they are: wheel, brake, lock mechanism, restraint, hinge, structural integrity, stability/tip over, and clearance (for entrapment). The draft proposed rule addresses the hazards associated with these components through performance requirements and more robust testing for things such as the restraint system, stability, brakes, wheel detachment, cord/straps, latching, and head entrapment. In addition, the staff recommends adding a new performance requirement and test procedure to address scissoring, shearing, and pinching hazards associated with 2D fold strollers.

TAB F: Initial Regulatory Flexibility Analysis of Staff-Recommended Proposed Standard for Carriages and Strollers

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**UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MARYLAND 20814**

Memorandum

Date: April 2, 2013

TO : Rana Balci-Sinha, Ph.D.
Project Manager, Strollers
Division of Human Factors
Directorate for Engineering Sciences

THROUGH: Gregory B. Rodgers, Ph.D.
Associate Executive Director
Directorate for Economic Analysis

Deborah V. Aiken, Ph.D.
Senior Staff Coordinator
Directorate for Economic Analysis

FROM : Jill L. Jenkins, Ph.D.
Economist
Directorate for Economic Analysis

SUBJECT : Initial Regulatory Flexibility Analysis of Staff-Recommended Proposed
Standard for Carriages and Strollers

Introduction

On August 14, 2008, the Consumer Product Safety Improvement Act (CPSIA) was enacted. Among its provisions, the Danny Keysar Child Product Safety Notification Act, section 104 of the CPSIA, requires the U.S. Consumer Product Safety Commission (CPSC or Commission) to evaluate the existing voluntary standards for durable infant or toddler products and promulgate a mandatory standard substantially the same as the applicable voluntary standard, or more stringent than the voluntary standard if the Commission determines that more stringent standards would further reduce the risk of injury. Strollers are among the durable products specifically named in section 104. Upon review, CPSC staff recommends that the Commission adopt the voluntary ASTM International (formerly known as the American Society for Testing and Materials) standard for carriages and strollers (F833-13), with one addition.

The Regulatory Flexibility Act (RFA) requires that proposed rules be reviewed for their potential economic impact on small entities, including small businesses. Section 603 of the RFA generally requires that agencies prepare an initial regulatory flexibility analysis (IRFA) and make it available to the public for comment when a general notice of proposed rulemaking is

published. The IRFA must describe the impact of the proposed rule on small entities and identify any alternatives that may reduce the impact. Specifically, the IRFA must contain:

1. a description of, and where feasible, an estimate of the number of small entities to which the proposed rule will apply;
2. a description of the reasons why action by the agency is being considered;
3. a succinct statement of the objectives of, and legal basis for, the proposed rule;
4. a description of the projected reporting, recordkeeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities subject to the requirements and the type of professional skills necessary for the preparation of reports or records; and
5. an identification, to the extent possible, of all relevant federal rules that may duplicate, overlap, or conflict with the proposed rule.

The Product³⁰

ASTM F833-13, *Standard Consumer Safety Performance Specification for Carriages and Strollers*, defines “carriages and strollers” as wheeled vehicles used for the transport of children. Motility is supplied by a walking non-occupant pushing or pulling on the handle. Carriages and strollers differ primarily by the intended age and position of the occupant. Infants lie flat in carriages, while both infants and older children use strollers in a seated or semi-reclined position. Strollers can generally be folded for storage, while most carriages cannot.

The staff-recommended rule includes jogging strollers, which typically have thicker, more robust wheels so that they can be moved at a quicker pace. Staff’s recommended scope for the stroller standard would also include strollers intended for use in public locations, such as malls and airports, as well as strollers used for multiple occupants. Multiple-occupant strollers, which are often used in day care situations, are also available for private consumer use and can accommodate up to 10 occupants. Wheeled products that can be self-propelled by a child are specifically excluded, as are shopping cart-style strollers used in grocery stores.

The Market for Strollers

The majority of strollers are produced and/or marketed by juvenile product manufacturers and distributors. CPSC staff believes that there are currently at least 86 suppliers of strollers to the U.S. market. Thirty-four are domestic manufacturers, 33 are domestic importers, and seven are domestic firms with unknown supply sources. There are also 12 foreign firms—six foreign manufacturers, two firms that import products from foreign companies and distribute them from outside of the United States, two foreign retailers that ship directly to the United States, and two firms with unknown supply sources.³¹ Staff expects that the products of 51 of the 86 stroller

³⁰ ASTM F833-13.

³¹ Determinations were made using information from Dun & Bradstreet and ReferenceUSAGov, as well as firm websites.

suppliers will be compliant with ASTM F833-13 because 20 are certified by the Juvenile Products Manufacturers Association (JPMA) to F833-11, and 31 claim compliance with F833.³²

Information on annual sales of strollers can be approximated, using information from the 2005 survey conducted by the American Baby Group (*2006 Baby Products Tracking Study*).³³ Nearly all new mothers (99 percent) own at least one stroller. Approximately 26 percent of strollers were handed down or purchased secondhand.³⁴ Thus, about 74 percent of strollers were acquired new. This suggests annual sales of about 3 million strollers ($.99 \times .74 \times 4.1$ million births per year).³⁵ Strollers can cost anywhere between \$20 to \$1,200, depending upon the type and brand. On average, umbrella strollers tend to be the least expensive (around \$25–\$50 for the least costly versions); most other strollers cost around \$150–\$300. However, many carriages, travel systems, and jogging strollers may be priced in the \$500–700 range.

It appears that strollers are used during a child's first two years with some caregivers continuing to use them into the third year.³⁶ We do not know what proportion of caregivers continue to use strollers into the third year; so we estimate risk, assuming that approximately 25–75 percent will do so. Based on data from the *2006 Baby Products Tracking Study*, nearly 4.1 million strollers are owned by new mothers. Therefore, there would be approximately 9.1–11.2 million households with strollers available for use annually ($4.1 \text{ million} \times .99 \times 2.25$ to $4.1 \text{ million} \times .99 \times 2.75$). According to Epidemiology (EPI) staff, there were an estimated 46,200 stroller-related emergency department-treated injuries to children under age 5 from January 2008 to December 2011, or an average of 11,550 annually.³⁷ Therefore, there may have been about 10.3–12.7 emergency department-treated injuries annually for every 10,000 strollers available for use in the households of new, second-year, and third-year mothers.

Reason for Agency Action and Legal Basis for the Draft Proposed Rule

The Danny Keysar Child Product Safety Notification Act requires the CPSC to promulgate a mandatory standard for strollers that is substantially the same as, or more stringent than, the voluntary standard. CPSC staff worked closely with ASTM to develop the new requirements

³² JPMA typically allows 6 months for products in their certification program to shift to a new standard once it is published. ASTM F833-13, the voluntary standard upon which the staff-recommended proposed standard is based, will become effective for JPMA certification purposes in November 2013.

³³ The data collected for the *Baby Products Tracking Study* do not represent an unbiased statistical sample. The sample of 3,600 new and expectant mothers is drawn from *American Baby* magazine's mailing lists. Also, because the most recent survey information is from 2005, it may not reflect the current market.

³⁴ The data on secondhand products for new mothers was not available. Instead, data for new mothers and expectant mothers were combined and broken into first-time mothers and experienced mothers. Data for first-time mothers and experienced mothers have been averaged to calculate the approximate percentage of strollers that were handed down or purchased secondhand.

³⁵ U.S. Department of Health and Human Services, Centers for Disease Control and Prevention (CDC), National Center for Health Statistics, National Vital Statistics System, "Births: Final Data for 2009," *National Vital Statistics Reports* Volume 60, Number 1 (November 2011): Table I. Number of births in 2009 is rounded from 4,130,665.

³⁶ ASTM F833-13.

³⁷ Memorandum from Angie Qin, Division of Hazard Analysis, Directorate for Epidemiology, dated April 2, 2013, Subject: Stroller-Related Deaths, Injuries, and Potential Injuries; January 2008–December 2012.

and test procedures that have been added to ASTM F833-13, which forms the basis of the staff-recommended proposed rule. Staff also worked with ASTM to develop the additional staff-recommended change to the standard that will address injuries associated with 2D frame folding/pinch points.³⁸

Requirements of the Proposed Rule

CPSC staff recommends adopting the voluntary ASTM standard for strollers (F833-13), with one addition. Some of the more significant requirements of the current voluntary standard for strollers (ASTM F833-13) are listed below:

- Latching mechanisms—intended to prevent unintentional folding while in use.
- Brakes—intended to limit movement with the braking mechanism engaged and prevent the occupant from releasing the brake while in the stroller.
- Static load testing on seating area—intended to ensure that the child remains fully supported while stationary.
- Stability test for preventing tip over—ensures that strollers will not tip over in “worst case scenario” situations, such as the child attempting to climb in while the stroller is on an inclined surface.
- Restraints—intended to ensure the integrity and effectiveness of restraint systems that are required in all strollers, except carriages that are intended to be used only for infants in a lying down position.
- Occupant retention—carriages and other strollers with reclined positions must have walls on all sides of the occupant seat to ensure that the child does not fall out.
- Impact test—ensures that car seats used in conjunction with a stroller or carriage remain attached at all points when repeatedly run into a rigid barrier.
- Passive containment/foot opening—intended to prevent entrapments in strollers with trays or grab bars.
- Wheel detachment—intended to ensure the integrity of stroller wheels and their assemblies.
- Cord/strap extensions and loops in occupant spaces—intended to prevent entanglements and choking hazards.
- 3D fold and canopy—intended to prevent scissoring, shearing, pinching, and, in some cases, amputation in the joints of 3D-folding strollers.
- Head entrapment—intended to address incidents, including one fatality, where children’s heads were caught in openings created when a stroller/carriage was combined with a rearward-facing car seat.
- Buckle release—intended to prevent children from releasing themselves from their stroller.

³⁸ Ibid; and memorandum from Gregory K. Rea, Director, Division of Mechanical Engineering, Directorate for Laboratory Sciences, dated April 2, 2013, Subject: Proposed Changes to the Voluntary Standard for Strollers (ASTM833-13)—Segue to a Mandatory CPSC Safety Standard for Strollers.

The voluntary standard also includes: (1) torque and tension tests to ensure that components cannot be removed; (2) requirements for several stroller features to prevent entrapment and cuts (minimum and maximum opening size, coverage of exposed coil springs, small parts, hazardous sharp edges or points, smoothness of wood parts, and edges that can scissor, shear, or pinch); (3) marking and labeling requirements; (4) requirements for the permanency and adhesion of labels; (5) requirements for instructional literature; and (6) toy accessory requirements. ASTM F833-13 includes no reporting or recordkeeping requirements.

CPSC staff has been working with ASTM on final language for a 2D frame folding requirement and recommends that it be included in the proposed stroller standard. Similar to the 3D fold and canopy requirements, the 2D frame folding requirements are intended to address scissoring, shearing, and pinching in stroller joints, and in particular, incidents where fingers were caught, and in some cases, amputated. According to EPI staff, there were 72 reported injuries involving fingers or arms pinched, lacerated, or amputated in 2D and 3D stroller hinges from January 2008 through December 2012, as well as an additional 27 incidents involving children older than 4 and adults.³⁹ Such incidents led to several compliance investigations and a number of recalls.⁴⁰ The staff-recommended addition would test more rigorously for these potential hazards within the occupant space in strollers that fold in two dimensions.⁴¹ The simplest way to meet this requirement is to replace the hinge creating the hazard or add a cover to prevent access. However, according to one manufacturer, any fix that was not part of the original design could appear like an add-on to consumers and make the product less desirable from their perspective. Additionally, changing a key component in such a complex, moving product could have an impact on other components as well. Therefore, some firms may decide to design new strollers, rather than redesign isolated parts of existing models.

In April 2012, the JPMA sent a letter to CPSC staff requesting a 24-month effective date.⁴² At the time, the hazards to be addressed were known, but the precise requirements were not. This issue, combined with the complexity of stroller designs, justified a significantly longer effective date. Since then, however, all but one of the requirements have been developed, balloted, and either approved by ASTM, or any negatives were found non-persuasive. Only the 2D frame folding requirement has not been finalized and approved by ASTM. Thus, firms have been able to start developing strollers that would meet the requirements of the staff-recommended proposed standard, apart from 2D frame folding. However, staff believes that a longer-than-average effective date is still justified, particularly to accommodate suppliers who may be unfamiliar with the ASTM standard development process. Therefore, staff is

³⁹ Quin 2013.

⁴⁰ Memorandum from Mike Lee, Compliance Officer, Division of Enforcement, Office of Compliance and Field Operations, dated April 2, 2013, Subject: Durable Nursery Products: Summary of Stroller Injuries, Recalls, and Defect Investigations from January 1, 2008 to September 15, 2012.

⁴¹ Memorandum from Jonathan Midgett, Engineering Psychologist, Office of Hazard Identification and Reduction, dated April 2, 2013, Subject: Human Factors Assessment of Hazard Patterns and Mitigation Strategies in Strollers and Rea 2013.

⁴² Letter from Mike Dwyer, Executive Director, Juvenile Products Manufacturers Association, to Jacob Miller, dated April 17, 2012, Subject: Carriages and Strollers Recommended NPR Effective Date.

recommending an 18-month effective date after final rule publication, which is consistent with recent manufacturer comments submitted as part of the ASTM balloting process.⁴³

Other Federal or State Rules

A final rule implementing sections 14(a)(2) and 14(i)(2) of the Consumer Product Safety Act (CPSA), as amended by the CPSIA, *Testing and Labeling Pertaining to Product Certification*, 16 C.F.R. part 1107, became effective on February 13, 2013 (the 1107 rule). Section 14(a)(2) of the CPSA requires every manufacturer of a children's product that is subject to a product safety rule to certify, based on third party testing, that the product complies with all applicable safety rules. Section 14(i)(2) of the CPSA requires the Commission to establish protocols and standards (i) for ensuring that a children's product is tested periodically and when there has been a material change in the product, (ii) for the testing of representative samples to ensure continued compliance, (iii) for verifying that a product tested by a conformity assessment body complies with applicable safety rules, and (iv) for safeguarding against the exercise of undue influence on a conformity assessment body by a manufacturer or private labeler.

Because strollers will be subject to a mandatory children's product safety rule, they will also be subject to the third party testing requirements of section 14(a)(2) of the CPSA and the 1107 rule when the stroller mandatory standard and the notice of requirements become effective.

Impact on Small Businesses

There are approximately 86 firms currently known to be marketing strollers in the United States. Under U.S. Small Business Administration (SBA) guidelines, a manufacturer of strollers is small if it has 500 or fewer employees, and importers and wholesalers are considered small if they have 100 or fewer employees. Based on these guidelines, about 51 are small firms—26 domestic manufacturers, 22 domestic importers, and three firms with unknown supply sources. There may be additional unknown small stroller suppliers operating in the U.S. market.

Small Manufacturers

The expected impact of the staff-recommended proposed standard on small manufacturers will differ based on whether their strollers are already compliant with F833-11. In general, firms whose strollers meet the requirements of F833-11 are likely to continue to comply with the voluntary standard as new versions are published. Many of these firms are active in the ASTM standard development process, and compliance with the voluntary standard is part of an established business practice. It is likely that firms supplying strollers that comply with ASTM F833-11 would also likely comply with F833-13 before the final stroller rule becomes effective.

⁴³ It is also consistent with the two development schedule timelines submitted by JPMA (17 months and 19.5 months).

Meeting ASTM F833-13's requirements could necessitate product redesign for at least some strollers not believed to be compliant with F833-11 (7 of 26 small domestic manufacturers), regardless of the staff-recommended addition. A redesign would be minor if most of the changes involve adding straps and fasteners or using different mesh or fabric, but could be more significant if changes to the frame are required. Due to the complexity of carriages and strollers, a complete redesign of these products, including engineering time, prototype development, tooling, and other incidental costs, could exceed \$1 million for the most complex stroller models. Industry sources, including JPMA,⁴⁴ note that new tooling alone could exceed \$300,000 per product model. However, costs and development time are likely to vary widely across firms. Companies with substantial experience in manufacturing strollers should be able to complete redesigns more cost effectively than firms with less experience. Additionally, firms with numerous stroller models may experience lower costs because stroller models could be redesigned as a group.

The direct impact on manufacturers whose products are expected to meet the requirements of ASTM F833-13 (19 of 26 small domestic manufacturers) could be significant in some cases, due to the staff-recommended 2D frame folding requirement, as well as the relatively low revenues associated with many small manufacturers. While meeting this requirement could be as simple as replacing hinges or adding covers, this may not be a realistic alternative for some firms. According to one manufacturer, it is difficult to make added parts look cohesive with the original product, a quality consumers might prefer. Therefore, some firms may need to develop new stroller models, rather than try to create cohesive products by retrofitting older models. The majority of small manufacturers have at least one 2D stroller model; so it is possible that at least some will opt to redesign their existing noncompliant strollers.

The direct costs of design/redesign on firms may be mitigated if they are treated as new product expenses that can be amortized, and staff recommends an 18-month effective date to help reduce further the impact of the staff-recommended proposed rule. This would give firms additional time to develop new/modified products and spread costs over a longer time frame. It is possible that additional time beyond 18 months may be required, however, and staff requests specific comments on alternative effective dates.

In addition to the direct impact of the staff-recommended proposed standard described above, there are indirect impacts. These impacts are considered indirect because they do not arise directly as a consequence of the stroller rule's requirements. Nonetheless, they could be significant. Once the rule becomes final and the notice of requirements is in effect, all manufacturers will be subject to the additional costs associated with the third party testing and certification requirements. This will include any physical and mechanical test requirements specified in the final rule; lead and phthalates testing is already required.

⁴⁴ Dwyer, 2012.

Based on industry input and confidential business information supplied for the development of the third party testing rule, testing to the ASTM voluntary standard could cost about \$800–\$1,000 per model sample.⁴⁵

On average, each small domestic manufacturer supplies seven different models of strollers to the U.S. market annually. Therefore, if third party testing were conducted every year on a single sample for each model, third party testing costs for each manufacturer would be about \$5,600–\$7,000 annually. Based on a review of firm revenues, the impact of third party testing to ASTM F833-13 is unlikely to be significant if only one stroller sample per model is required. However, if more than one sample would be needed to meet the testing requirements, it is possible that third party testing costs could have a significant impact on one or more of the small manufacturers.

Small Importers

In the absence of regulation, small importers of strollers currently in compliance with F833-11 (13 of 22 small domestic importers) would likely continue to comply with the voluntary standard as it evolves, as well as the final mandatory standard. Any increase in production costs experienced by their suppliers may be passed on to them. Given the possibility that even firms with compliant strollers may opt to design a new stroller rather than retrofit their existing stroller models, the costs associated with the added 2D folding frame requirement could be significant for some firms, especially those that do not follow the ASTM standard development process (as is the case with at least one small importer of compliant strollers).

Importers of strollers would need to find an alternate source if their existing supplier does not come into compliance with the requirements of the staff-recommended proposed rule, which may be the case with the nine importers of strollers not believed to be in compliance with F833-11. Some could respond to the rule by discontinuing the import of their noncomplying strollers, possibly discontinuing the product line altogether. The impact of such a decision could be mitigated by replacing the noncompliant stroller with a compliant stroller, or by deciding to import an alternative product in place of the stroller. However, some of these firms have few or no other products in their product line.

Because many of these firms have low sales revenues and limited product lines apart from strollers and stroller accessories, it is possible that the staff-recommended proposed rule could have a significant impact on one or more importers, regardless of the staff-recommended addition. The staff-recommended 18-month effective date would spread the costs of compliance over a longer period of time, mitigating the impact on all importers.

As is the case with manufacturers, all importers will be subject to third party testing and certification requirements, and consequently, will experience costs similar to those for manufacturers if their supplying foreign firm(s) does not perform third party testing. The

⁴⁵ One firm said that complete CPSIA testing for one stroller model is greater than \$5,000, primarily due to the high cost of chemical evaluations and the number of coatings and substrates involved.

resulting costs could have a significant impact on a few small importers that must perform the testing themselves, even if only one sample per model is required.

Alternatives

Under the Danny Keysar Child Product Safety Notification Act, one alternative that would reduce the impact on small entities is to make the voluntary standard mandatory with no modifications. Doing so would eliminate the impact on the 19 small manufacturers and 13 small importers with compliant products. However, adopting the voluntary standard with no modifications may not substantially benefit firms with noncompliant products, as their strollers might still require redesign.

Staff is recommending an 18-month effective, which is consistent with recent manufacturer comments submitted as part of the ASTM balloting process. This will allow suppliers additional time to modify and/or develop compliant strollers and spread the associated costs over a longer period of time. However, the Commission could opt to set a later effective date, more in line with the JPMA's suggested 24 months. Doing so would reduce further the impact on affected firms. A third alternative would be to set an earlier effective date. However, setting an earlier effective date could increase the impact of the staff-recommended rule on small entities.

TAB G: Regulatory Flexibility Analysis of the Accreditation Requirements for Conformity Assessment Bodies for Testing Conformance to the Carriage and Stroller Standard

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**UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
BETHESDA, MD 20814**

Memorandum

Date: April 2, 2013

TO : Rana Balci-Sinha, Ph.D.
Project Manager, Strollers
Division of Human Factors
Directorate for Engineering Sciences

THROUGH : Gregory Rodgers, Ph.D.
Associate Executive Director
Directorate for Economic Analysis

Deborah V. Aiken, Ph.D.
Senior Staff Coordinator
Directorate for Economic Analysis

FROM : Jill L. Jenkins, Ph.D.
Economist
Directorate for Economic Analysis

SUBJECT : Regulatory Flexibility Analysis of the Accreditation Requirements for
Conformity Assessment Bodies for Testing Conformance to the Carriage and
Stroller Standard

In accordance with section 14 of the Consumer Product Safety Act (CPSA), children's products that are subject to a children's product safety rule must be tested by an accredited conformity assessment body for compliance with the product safety rule. Staff is proposing an amendment to 16 CFR part 1112 that would establish the requirements for the laboratory acceptance of the accreditation of a conformity assessment body to test for compliance with the stroller/carriage proposed rule. This memorandum assesses the impact of the amendment on the small laboratories.

Section 14(a)(3) of the CPSA requires the Commission to publish a notice of requirements (NOR) for the accreditation of third party conformity assessment bodies (or testing laboratories) to test for conformance with each children's product safety rule. Effective June 10, 2013, the Commission published a final rule, *Requirements Pertaining to Third Party Conformity Assessment Bodies*, 78 Fed. Reg. 15836 (March 12, 2013), which codifies part 1112. Part 1112 establishes requirements for accreditation of third party conformity assessment bodies (or laboratories) to test for conformance with a children's product safety rule in accordance with

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Section 14(a)(2) of the CPSA. The final rule also codifies all of the NORs that the CPSC has published to date. All new NORs, such as the stroller/carriage standard, require an amendment to this rule.

On May 24, 2012, staff conducted an analysis of the potential impacts on small entities of the proposed rule establishing accreditation requirements, 77 Fed. Reg. 31086, 31123-26, as required by the Regulatory Flexibility Act and prepared an Initial Regulatory Flexibility Analysis (IRFA). Briefly, the IRFA concluded that the requirements would not have a significant adverse impact on a substantial number of small laboratories because no requirements are imposed on laboratories that do not intend to provide third party testing services under section 14(a)(2) of the CPSA. The only laboratories that are expected to provide such services are those that anticipate receiving sufficient revenue from providing the mandated testing to justify accepting the requirements as a business decision. Laboratories that do not expect to receive sufficient revenue from these services to justify accepting these requirements would not likely pursue accreditation for this purpose. Similarly, amending the rule to include the NOR for the stroller/carriage standard would not have a significant adverse impact on small laboratories. Moreover, based upon the number of laboratories in the United States that have applied for CPSC acceptance of the accreditation to test for conformance to other juvenile product standards, we expect that only a few laboratories will seek CPSC acceptance of their accreditation to test for conformance with the stroller/carriage standard. Most of these laboratories will have already been accredited to test for conformance to other juvenile product standards and the only costs to them would be the cost of adding stroller/carriage standard to their scope of accreditation. As a consequence, the Commission could certify that the proposed notice requirements for the stroller/carriage standard will not have a significant impact on a substantial number of small entities.